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COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)
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This appendix is one of a series making up the complete Columbia-North Pacific Region Framework Study on water and related lands. The results of the study are contained in the several documents as shown below:

Main Report

Summary Report

Appendices

I. History of Study

II. The Region

III. Legal & Administrative Background

IV. Land & Mineral Resources

V. Water Resources

VI. Economic Base & Projections

VII. Flood Control

VIII. Land Measures & Watershed Protection

IX. Irrigation

X. Navigation

XI. Municipal & Industrial Water Supply

XII. Water Quality & Pollution Control

XIII. Recreation

XIV. Fish & Wildlife

XV. Electric Power

XVI. Comprehensive Framework Plans

Pacific Northwest River Basins Commission
1 Columbia River
Vancouver, Washington

Fish & Wildlife

6

APPENDIX XIV.

Columbia-North Pacific Region
Comprehensive Framework Study
of Water and Related Lands. Appendix XIV.
Fish and Wildlife,

10

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Submitted by

Pacific Northwest River Basins Commission
Vancouver, Washington

410 072

APPENDIX XIV
Fish and Wildlife

Prepared under the direction of the
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This appendix to the Columbia-North Pacific Region Framework Report was prepared at field level under the auspices of the Pacific Northwest River Basins Commission. It is subject to review by the interested Federal agencies at the departmental level, by the Governors of the affected States, and by the Water Resources Council prior to its transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration.

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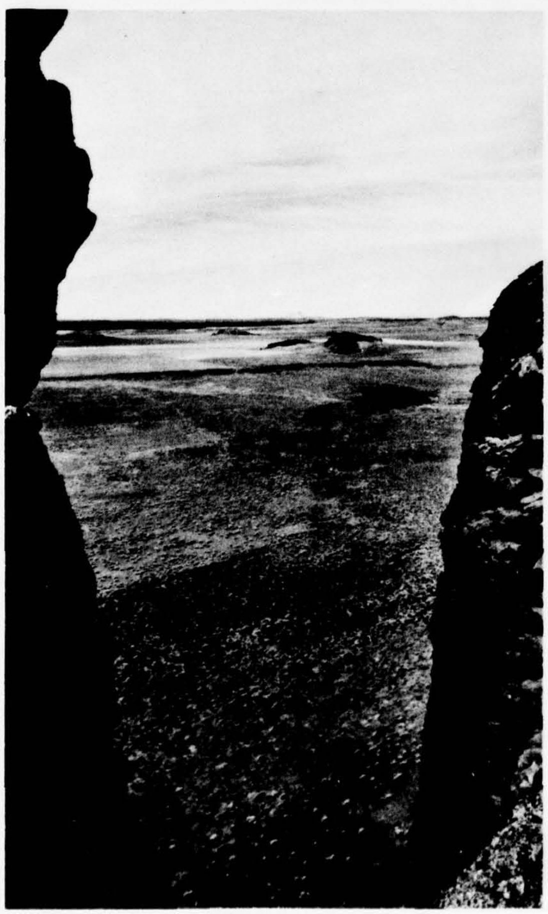


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COMPREHENSIVE FRAMEWORK STUDY

C-NP REGION

FIGURE 1

INTRODUCTION

PURPOSE AND SCOPE

The Fish and Wildlife appendix has three principal purposes. One is to describe the existing fish and wildlife resources and their use in the Columbia-North Pacific Region ~~(figure 1)~~. Another is to estimate the future demands for these resources. The third and most important purpose is to present opportunities and alternatives to meet future fishing and hunting needs through the conservation and development of fish and wildlife resources.

The appendix is limited primarily to available basic data. It covers only areas and species dependent upon or affected by fresh water. Descriptions of fish and wildlife resources include identification of species, general extent and quality of habitat, fishing and hunting use, and factors affecting the resources. This material is presented for each of several fish and wildlife groups in sufficient detail to identify essential habitat and critical problems and to show differences among subregions.

The estimates of future demands and needs for fish and wildlife resources are expressed only for fishing and hunting use. The discussion basically applies to the region as a whole and projections of fishing and hunting are shown in tables by subregion and the region.

The opportunities or measures to help satisfy future needs for fish and wildlife include habitat preservation, habitat improvement, greater harvest, and augmentation of supply. These measures vary in detail but are sufficient to provide input for general plan formulation. To the extent possible, locations, timing, amounts of water and related lands involved, and costs are specified. Advanced fish and wildlife studies are needed to determine specific actions, developments, and costs required for preparation of a detailed comprehensive plan.

A summary of studies, legislation, and policy changes needed to improve the status of fish and wildlife in water and related land resources development is ~~also~~ included.

RELATIONSHIP TO OTHER PARTS OF REPORT

The Fish and Wildlife Appendix is one of nine functional appendices. It uses basic data from the three supporting appendices--Appendix IV, Land and Mineral Resources; Appendix V, Water Resources; and Appendix VI, Economic Base and Projections.

A close relationship also exists with the other functional appendices. Fishing and hunting data and other information were provided for Appendix XIII, Recreation. Fish and wildlife resources are dependent upon good water quality. Changes in environment resulting from the various uses frequently affect fish and wildlife resources; some changes may be beneficial, and some destructive.

Information from the Fish and Wildlife Appendix was used in preparing Appendix XVI, Comprehensive Framework Plans, and appropriate parts of the Main Report.

HISTORY OF FISH AND WILDLIFE

The Columbia-North Pacific Region is rich in fish and wildlife resources. It was in general much richer before exploitation, destructive logging, agricultural-municipal-industrial pollution, water project construction, urbanization, and other factors limited numbers and varieties of animals.

Before the coming of white men, the Indian population was distributed throughout the region. Populations were very high along the coast, around Puget Sound, and far up the Columbia and Snake River drainages. Coastal and lower Columbia River tribes occupied fairly permanent villages near productive fishing places. Fish were principal items of commerce during this period. Salmon, eulachon, and other species were dried and traded to interior tribes. The numbers of fish harvested by Indians were probably large, even by present standards. The catch of salmon from the Columbia River drainage was about 18 million pounds annually. Such tribes, since they had neither agriculture nor a permanent supply of fish or shellfish, subsisted by hunting and food gathering, except during periodic treks to the rivers to trade for or catch salmon, lamprey, and other anadromous species.

In 1778 Captain Cook's men discovered that furs they had obtained by barter with the Indians were practically worth their weight in gold to the merchants of China. This marked the beginning of international exploitation of the Pacific Northwest's natural resources.

By 1800 Puget Sound and the Northwest Coast were well known to British and American traders, primarily interested in sea otter skins, but little was known of the interior south of the mouth of the Bella Coola River. Lewis and Clark made the first overland trip to the mouth of the Columbia in 1805.

Astor's trading post at the mouth of the Columbia was established in 1811. This was taken over by the Northwest Company in 1813, and a system of trading posts and trapping expeditions soon covered the Northwest wherever beavers were obtainable. In 1821, the company was absorbed by the Hudson's Bay Company which soon (1824) moved its headquarters to a point on the Columbia opposite the mouth of the Willamette, Fort Vancouver. But the bonanza fur trading and trapping days were soon over. Beaver had vanished from many streams and most other furs were hard to get and worth less money. The company turned to other industries to supplement decreasing revenues. In addition to agriculture and lumbering, salmon salting was one of the industries established. The Indians had dried salmon for untold centuries; many trading vessels had salted a few barrels for the crew's use, and one ship, the Owyhee, had landed 53 barrels at Boston in 1830. The fur company's salting monopoly was soon broken and the industry built up gradually as markets were established--at first in the Hawaiian Islands, and later in Europe and East Coast ports. Small salting plants were established along the lower Columbia, and at the mouths of several rivers along the coast. Between 1830 and 1870, the fish runs were probably at all time highs. During this period there were no dams, pollution, or accelerated erosion, the Indian population had been reduced, and the salting plants processed a very small percentage of the spring chinook salmon run.

In 1866 William Hume constructed the first Pacific Northwest salmon cannery. This was on the Columbia River near what is now Longview, Washington. His first year's pack (1867) was 4,000 48-can cases; second year's, 18,000 cases; third year's, 28,000 cases. The pack was practically all spring chinook; other species were considered to be inferior fish, not worth catching. By 1884 there were 39 canneries on the Columbia, and the pack was 620,000 cases.

The first Puget Sound cannery was established at Mukilteo in 1877. Its first year's pack was 5,500 cases of coho salmon. This cannery later processed the first pink salmon ever canned. The fishing industry did not really boom in Puget Sound until after the arrival of the railroads. The largest pack was in 1913 when 45 canneries packed nearly two and one-half million cases. The largest Columbia River catch was 49.5 million pounds in 1911. The extension of the railroads to Portland in 1883 and Tacoma in 1887 did much to increase the market for fish products. Iced salmon, trout, and sturgeon could not be shipped to eastern points. In 1892 the catch

of white sturgeon in the Columbia River was about 5.5 million pounds; in 1899, less than 100,000 pounds.

The oyster industry had its beginning in 1851 when shipments from Willapa Bay to San Francisco began. These were the small, native oysters. By the early 1880's harvest began to decline. After the transcontinental railroads reached Puget Sound, seed oysters were brought in by the carload from Atlantic Coast points, and the industry revived. By the early 1920's, harvest was again declining but was somewhat revived by the importation of seed from Japan beginning about 1931. Olympia oysters are still harvested and command a very high price, but the Japanese oyster is the mainstay of the industry.

The twenty years before the turn of the century were crucial ones for fish and wildlife. In 1880 there were few people, little logging, no intensive agriculture, practically no pollution, few dams, and most rangelands were still in good condition. The anadromous fish runs were still large and various species could ascend 1,200 miles up the Columbia River and 600 miles up the Snake River to spawn. Elk, deer, bear, mountain sheep, and antelope were common; waterfowl flocked in on the rivers and marshes; and sage grouse and sharp-tailed grouse were abundant on the prairies. Most fur animals were numerous by today's standards. By the 1890's logging, which had been mostly restricted to timber near tidewater, began to occur inland. Splash and roll dams were built and operated on practically every coastal, Puget Sound, and lower Columbia stream. Anadromous fish in many small creeks and rivers were blocked by the dams and debris, eggs were flushed out of spawning beds, and stream bottoms were silted.

Livestock increased on the open ranges. Mountain sheep were practically eliminated about 1885, probably by scabies from domestic sheep.

Human population increased rapidly in parts of the region. Domestic pollution became noticeable. A law was passed by the Oregon Legislature prohibiting the dumping of mill wastes into streams, a fish protection measure.

The first paper mill in the Northwest was put into operation at Oregon City in 1866. Dams were constructed to produce power, to store water for irrigation, and for municipal and industrial use. Marshlands were drained. Many species of fish and game were sold on the open market and market hunting became a common livelihood.

Fish hatcheries and egg-taking stations were established on many rivers. Fish ladders were constructed at some dams and a few

natural obstacles. Exotic species of fish and birds were introduced: bobwhite in 1879, ring-necked pheasant in 1882, shad in 1885, carp about 1880, bullhead at several places in the 1880's or before, largemouth bass in 1888, sunfish in 1893 or before, and crappie in 1890.

Other warmwater fish arrived when display tanks were emptied at the close of the Lewis and Clark Centennial Exposition in Portland in 1905. Bullfrogs arrived in the 1890's. Striped bass spread from California to southwestern Oregon streams about 1914; walleye were introduced fairly recently.

The first attempts to manage the fish and wildlife resources were in 1865 when the Montana Territorial Legislature set regulations governing trout fishing. Washington Territory established laws limiting fixed fishing gear in 1871. This was followed in 1877 by the setting of seasons, and in later years by more and more stringent regulations designed to perpetuate fish runs. By 1965 all streams except the Columbia River downstream from Bonneville Dam had been closed to commercial salmon fishing (except by Indians), there were severe restrictions on type and use of gear, and the season was limited to 77 days.

Game and fish departments were fairly well organized by 1910. Hunting and fishing licenses were generally required, and seasons and bag limits were set for most species. Regulations were usually quite generous compared to present standards, but some species were accorded complete protection.

The first Northwest fish hatcheries were established on the Rogue and Clackamas Rivers by salmon packers in 1876 or 1877, and several more hatcheries (State, Federal, and private) were established before 1900. Early hatcheries were simple facilities, not very effective, and sometimes responsible for the destruction of fish runs. By about 1910 the concept of rearing salmon and steelhead was being accepted, and by 1965 the hatchery program was the largest and most effective of all programs for propagating fish resources.

State-owned and -operated game farms, mostly for ring-necked pheasant, were much in vogue in the 1920's and 30's and were effective sources for stock for unused habitat. Present day game farms are principally used for production of game birds for under-gun release on public shooting areas and for experimental propagation of other exotic bird species for possible introduction in the region. High fur prices in the early 1920's stimulated interest in fur farming. Private muskrat, skunk, fox, and mink farms were established, but only the last two proved profitable and fox farms did not survive very long after the 1946 fur market crash.

Several small Federal wildlife refuges, mostly for the protection of colonial nesting birds, were created early in this century; and in the second and third decades a profusion of State and local refuges, principally "no hunting" zones around population centers, were created. A few of these still exist, but most State-owned areas are now used for public hunting and many other forms of outdoor recreation. During the 1930's the Federal refuge system was expanded and by 1965 included about 35 refuges and game ranges in the region. Acquisition of refuges, key wildlife habitat, wildlife-related recreation areas, and public shooting grounds by both State and Federal agencies is still in progress, as is acquisition of public fishing and boat launching areas.

The demand on fish and wildlife resources has been increasing rapidly with increases in population and interest in outdoor recreation and environmental quality. Unfortunately, habitat for many species of fish and wildlife has been destroyed, and additional habitat will be destroyed as long as human population increases. Each piece of farmland that has been turned into a housing development, each highway, each airport, each bit of estuary that has been filled, each dam that has been constructed has decreased the available habitat. At the same time, the quality of much of the remaining habitat has been impaired by pollution in all its many forms, a more intensive agriculture, dewatering of streams, and other factors associated with industrialized society.

The steady loss of fish and wildlife habitat seems to be an increasing trend, but it is essential to lead industrial and urban development away from key or critical habitat, and by proper planning and zoning, proficient management, and adequate funding, reduce the impact of such development where it occurs. Much of the quality impairment, on the other hand, has occurred because of ignorance, an overt disregard for the ownership of public resources, and public apathy. The recently aroused public concern for this treatment may force a reversal of past trends and result in some improvement in the quality of remaining habitat.

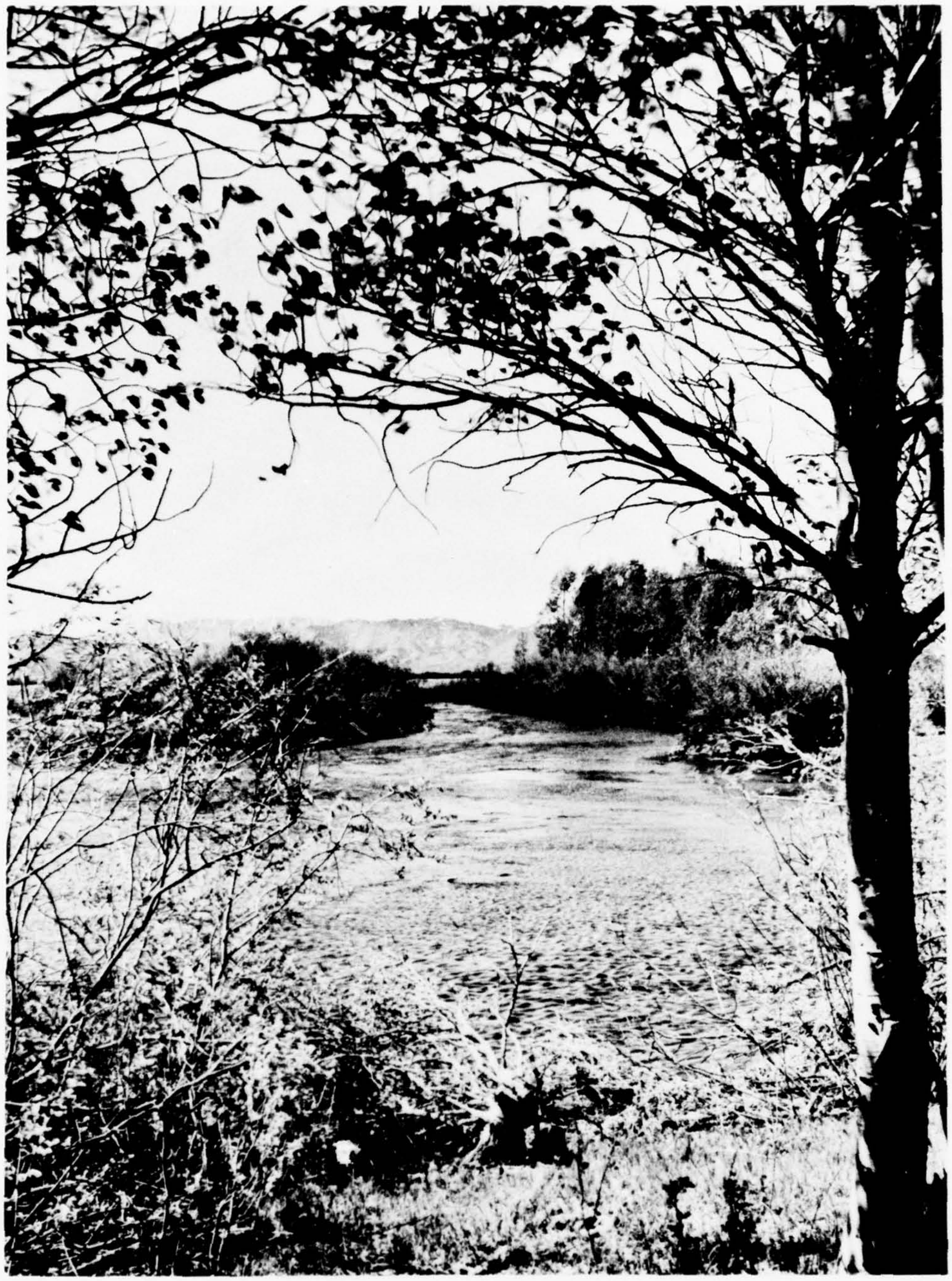
R E G I O N A L   S U M M A R Y

PRESENT STATUS

Fish and wildlife of the Columbia-North Pacific Region are divided into eight groups: anadromous fish, resident fish, marine fish and shellfish, big game, upland game, fur animals, waterfowl, and other wildlife. Representative species of resident fish and all wildlife groups inhabit every subregion. Eight of the subregions produce anadromous fish, but marine fish and shellfish are limited to the Coastal and Puget Sound Subregions.

Habitat varies considerably in type, quality, and amount. Portions of all waters, forests, ranges, and croplands provide habitat. Although measurements of the habitat types are not available, evidence indicates that winter ranges for deer, elk, and other big game, and free-flowing streams and estuaries, are in especially critical supply. Reduction in either quantity or quality of these habitats further diminishes the associated fish and wildlife populations, and in most cases the habitat cannot be replaced. On the other hand, some habitat types are more abundant. Fish habitat provided by lakes and reservoirs is ample although of variable quality. Summer range for deer and elk, the principal big game species, is abundant in relation to available winter range. Upland game habitat occurs mostly on farm and range lands and the gross supply, though diminishing, is not critical. Habitat quality, however, has decreased in many areas. The region's many bays, estuaries, marshes, shallow lakes, and streams provide waterfowl habitat important for wintering, nesting, and resting during migrations. Although much waterfowl habitat has been destroyed, a small amount of new habitat has been created. Almost all of the land area supporting vegetation provides habitat for some species of fur animal or other wildlife.

Sport fishing use for 1965 exceeded 21 million man-days. Hunters spent approximately 10.5 million man-days. The distribution of these uses by subregion and fish and game groups is shown in table 1. Commercial fishermen landed more than 183 million pounds of anadromous fish, marine fish, and shellfish. Other recreational use related to fish and wildlife, such as wildlife observation and photography, is certainly substantial and important, but it has not been measured or estimated, and figures are unavailable. Sources of use estimates throughout the appendix were the several State fish and game agencies, the Bureau of Sport Fisheries and Wildlife, and National Marine Fisheries Service. Estimates of expenditures



Regional waters and lands support many forms of fish and wildlife. (Idaho Fish and Game Department)

associated with fishing and hunting were calculated by multiplying use figures by the appropriate daily expenditure figures shown in the Bureau of Sport Fisheries and Wildlife 1965 National Survey of Fishing and Hunting.

Table 1 - Sport Fishing and Hunting Use, Columbia-North Pacific Region, 1965

	User-Days by Subregion (1000)												
Activity	1	2	3	4	5	6	7	8	9	10	11	12	Totals
Fishing													
Anadromous Fish 1/	0	-	-	0	0	-	-	-	-	-	-	0	5,040
Resident Fish	1,510	2,704	753	705	610	686	1,047	679	994	1,200	3,510	129	14,527
Marine Fish	0	0	0	0	0	0	0	0	0	633	73	0	706
Shellfish	0	0	0	0	0	0	0	0	0	952	121	0	1,073
Totals	1,510	-	-	705	610	-	-	-	-	-	-	129	21,346
Hunting													
Big Game	400	406	217	336	335	830	669	220	326	587	363	111	4,800
Upland Game	250	659	288	348	498	394	250	131	337	235	277	19	3,686
Waterfowl	100	276	104	176	156	75	63	47	111	97	208	23	1,436
Other Wildlife	75	28	10	80	98	120	40	7	80	29	10	5	582
Totals	825	1,369	619	940	1,087	1,419	1,022	405	854	948	858	158	10,504

1/ Sport fishing use data for anadromous fish not available for most subregions.

Numerous and varied factors, both natural and artificial, affect production and use of the resources. Some factors are detrimental and destroy or impair habitat; others benefit the resources by creating or improving habitat.

Anadromous Fish

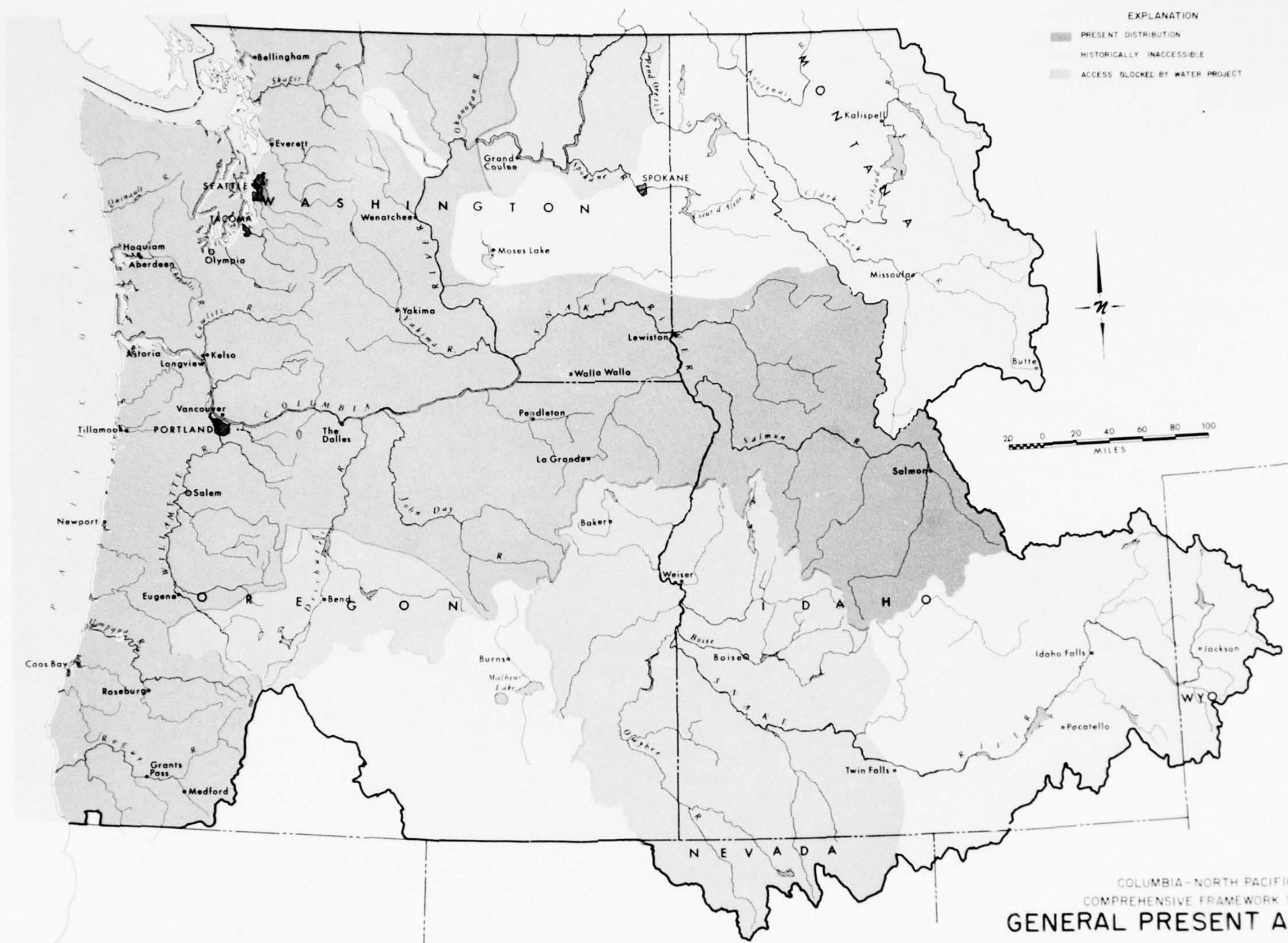
The Columbia-North Pacific Region is noted for its extensive anadromous fish resource and associated commercial and sport fisheries. These fisheries occur primarily in Subregions 10 and 11, and adjacent coastal waters, but are dependent upon fish production in eight of the twelve subregions. Anadromous fish production in six of the subregions also supports an important sport fishery in the Columbia River system as far upstream as the Salmon and Clearwater River drainages of Idaho and a significant commercial fishery in the Columbia River downstream from Bonneville Dam, as well as an Indian commercial fishery on the Columbia River and its tributaries

between Bonneville and McNary Dams. Because of the complex relationship between production and harvest, an analysis on a subregional basis is impractical, and a regional analysis is presented for the "Present Status" and "Future Needs" sections of the appendix. The "Means to Satisfy Needs" data are presented by subregion.

Anadromous fish in the region are divided into two groups--salmonids and non-salmonids. The salmonid group includes chinook, coho, pink, sockeye, and chum salmon; steelhead and cutthroat trout; and Dolly Varden. Non-salmonids include American shad, white sturgeon, striped bass, eulachon, and Pacific lamprey.

Salmonids are of local, national, and international recreational and commercial importance. Regional sport fishing effort in 1965 included participants from 47 States and several foreign countries. Treaties and agreements between the United States and foreign countries have been enacted to regulate the commercial fishing of these stocks in the Pacific Ocean. Natural spawning stocks are generally distributed throughout the region in streams which remain accessible to these migratory species (figure 2). However, because so much natural production area has been lost extensive artificial propagation facilities are now required to maintain the present harvest (figure 3). Most anadromous salmonid populations, in general, may be described as "holding their own," and some have at least slowed their downward trend, despite the many adverse conditions that are constantly influencing their existence.

Non-salmonid species are of commercial and recreational importance. This group is generally more restricted in distribution than salmonids. The Pacific lamprey is detrimental as a predator of salmonid fish in the open ocean. It is not known how many fish these animals kill; however, many salmon and steelhead are taken each year showing lamprey marks. This species inhabits nearly all regional streams, however sport and commercial importance is minor. There is a good sport fishery for American shad; however, the spawning run is brief and these fish are available to sportsmen for only about a month. Commercial harvest is limited because of low prices and conflicts with the salmon harvests. Commercial fishermen usually take sturgeon incidentally during the commercial salmon season. A good sport fishery exists primarily during the spring and fall. Eulachon support a good commercial and sport fishery; however, it too is a fishery of short duration usually occurring during late March and April. Striped bass are spring run fish found primarily in southern Oregon coastal streams. The run is brief, however it is a very popular sport fish and also is caught commercially.



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

GENERAL PRESENT AND PAST DISTRIBUTION OF ANADROMOUS FISH
C-NP REGION

1970

FIGURE 2

FIGURE 3. EXPLANATION

Symbol No.	Hatchery
1	Nooksack
2	Bellingham
3	Samish
4	Skagit
5	Winthrop
6	Chelan
7	Columbia Basin
8	Entiat
9	Leavenworth
10	Skykomish
11	Dungeness
12	Quilcene
13	University of Washington
14	Tokul
15	Issaquah
16	Green River
17	Minter Creek
18	Hood Canal
19	Shelton
20	George Adams
21	South Tacoma
22	Puyallup
23	Puyallup
24	Simpson
25	Aberdeen
26	Nemah
27	Willapa
28	Grays River
29	Mossyrock
30	Toutle
31	Yakima
32	Klickitat
33	Goldendale
34	Spring Creek
35	Willard
36	Little White Salmon
37	Carson
38	Speelyai
39	Skamania
40	Vancouver
41	Old Vancouver
42	Lewis River
43	Kalama Falls
44	Lower Kalama
45	Abernathy
46	Elokomin
47	Beaver Creek
48	Gnat Creek
49	Big Creek
50	Klaskanine
51	Nehalem
52	Trask
53	Cedar Creek
54	Eagle Creek
55	Sandy
56	Bonneville
57	Cascade
58	Ox Bow
59	Hood River
60	Washougal
61	Oak Springs
62	Wizard Falls
63	Marion Forks
64	South Santiam
65	Roaring River
66	Siletz
67	Alsea
68	Alsea
69	McKenzie
70	Willamette
71	Rock Creek
72	Bandon
73	Butte Falls
74	Circle C
75	Oxbow
76	Hayden Creek

Symbol No.	Ponds and Channels
1	Sprague Lake
2	Newhalem Pond
3	Maylor Lagoon
4	Kennedy Lagoon
5	Crockett Lake
6	Raabs Lagoon
7	Anderson Lake
8	Clallam Pond
9	Dickey Lake
10	Pleasant Lake
11	Kingston Lagoon
12	Wells Spawning Channel
13	Rocky Reach Spawning Channel
14	Keyport Lagoon
15	Little Clam Bay
16	Heines Lake
17	Alexander Lake
18	Erdman Lake
19	Prickett Lake
20	Melbourne Lake
21	West Lake
22	Campbell Slough
23	Johnson Slough
24	Satsop Springs Spawning Channel
25	Cranberry Lake
26	Whiteman's Cove Pond
27	Capitol Lake
28	Silver Springs
29	Sequallitchew Lake
30	Titlow Lagoon
31	Titlow Pond
32	Priest Rapids Spawning Channel
33	McNary Spawning Channel
34	Greenleaf Slough
35	Salmon Creek Pond
36	Swafford Valley Rearing Pond
37	Blue Creek Slough
38	Chinook River Rearing Pond
39	Black Lake Rearing Pond
40	Waukeena Rearing Pond
41	Cascade Gateway
42	North Santiam
43	Lint Slough
44	Carmen Smith Spawning Channel
45	Dexter Holding Ponds
46	Whistlers Bend
47	Decker Flat Rearing Pond
48	Bear Valley Holding Pond
49	Big Springs Hatching Channel
50	Stolle Meadows Holding Pond
51	Crooked River Hatching Channel
52	Red River Hatching Channel
53	Running Creek Hatching Channel
54	Fenn Hatching Channel
55	Ditch Creek Hatching Channel
56	Indian Creek Hatching Channel
57	Lemhi Holding Pond
58	Abernathy Incubation Channel

EXPLANATION

FEDERAL ANADROMOUS FISH HATCHERY

STATE ANADROMOUS FISH HATCHERY

FEDERAL REARING PONDS & SPAWNING CHANNELS

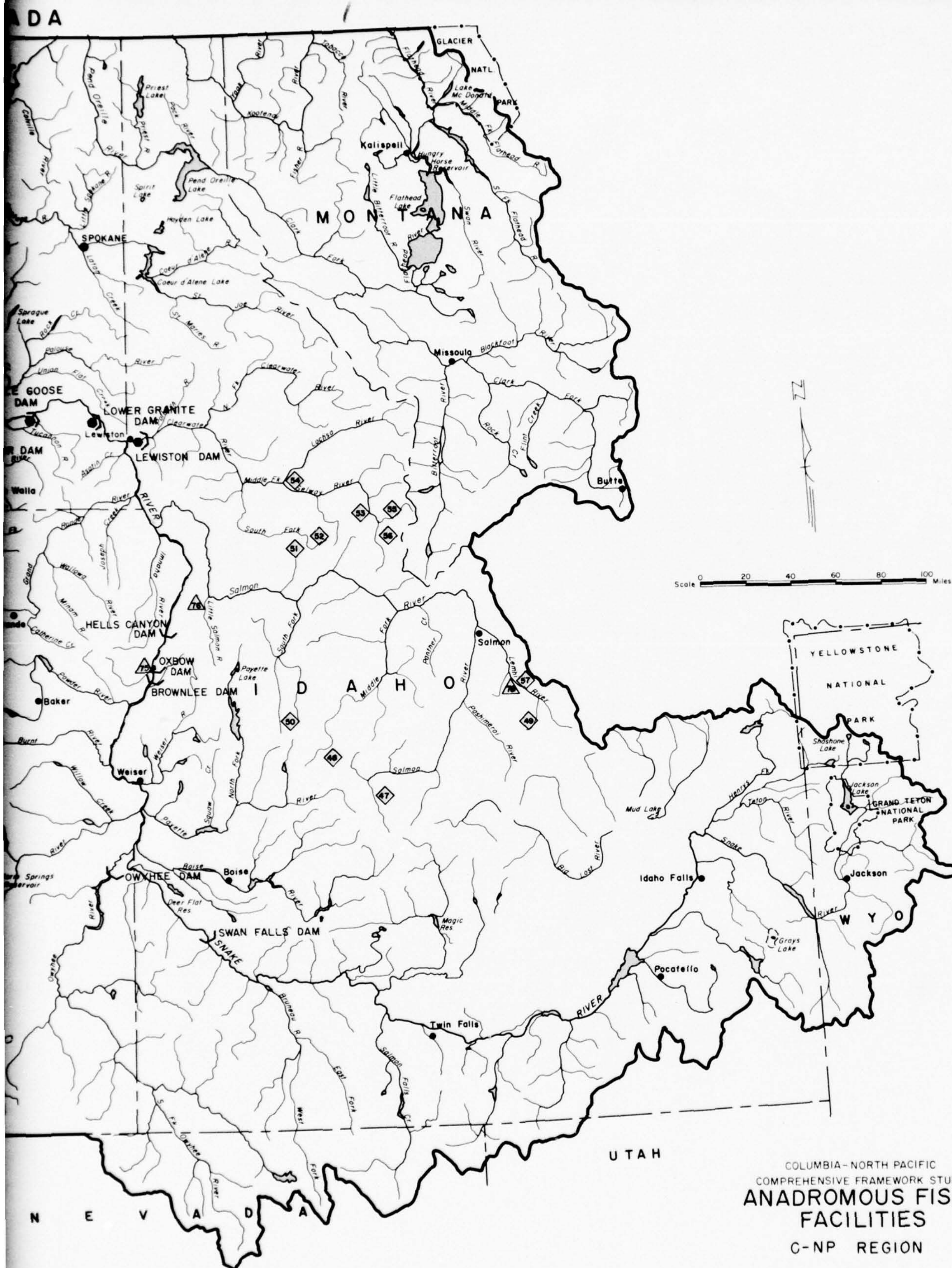
STATE REARING PONDS & SPAWNING CHANNELS

MAJOR FISH LADDER AFFECTING ANADROMOUS FISH

MAJOR DAMS

NOTE: Numbers correspond with names in list accompanying map

2



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

ANADROMOUS FISH FACILITIES

C-NP REGION

1970

FIGURE 3

Habitat

Habitat generally suitable for the successful reproduction and survival of anadromous salmonid fish consists of readily accessible streams,[1/] with a minimum of pollution, cool water, an abundance of spawning gravel and rearing pools, and an adequate and stable streamflow. Most streams fall into this category; however, many factors influence one or more of the criteria for suitable habitat.

Anadromous fish occur in nearly all rivers and streams tributary to the Pacific Ocean and Puget Sound. All accessible waters are inhabited by one or more species of adult and/or juvenile anadromous fish throughout the year. Most coastal streams are short and have not yet undergone extensive water resource development with the exception of the Rogue and Umpqua Rivers in southern Oregon. Spawning and rearing occur in the short streams a relatively short distance from the ocean, although suitable spawning and rearing habitat exists in the upper reaches of many streams that are inaccessible because of natural and/or manmade barriers. Coastal streams still offer a potential for increased anadromous fish production.

Chinook salmon once traveled nearly 1,200 miles up the Columbia River to spawn in Canada, downstream from Lake Windermere. With the blockage of the Columbia River in 1938 by the construction of Grand Coulee Dam, anadromous fish lost access to over 500 miles of the upper river and many miles of tributaries (figure 2). Anadromous fish have also lost access to over 50 percent of the Snake River due to dam construction (table 2). Over 450 miles of the Columbia downstream from Grand Coulee Dam have been changed from free-flowing river to impoundments by dam construction (table 2). This change in habitat conditions has eliminated all of the river except the reach from Lake Wallula to Priest Rapids Dam for salmonid spawning. The river serves primarily as a migration route via fish ladders to spawning grounds in tributary streams as far as 900 miles from the ocean.

Coho and chinook salmon and steelhead trout are generally distributed throughout the region, while sockeye, chum, and pink salmon are most abundant from the mouth of the Columbia River northward. Major populations of other species are found as follows: striped bass in the Coquille, Coos, and Umpqua Rivers of Oregon; American shad primarily in the Columbia River; eulachon in the Cowlitz and Lewis Rivers of Washington and the Columbia River; and white sturgeon in nearly all major rivers and streams.

1/ Streams with no barriers to fish or streams that have been made accessible by ladders or barrier removal.

Table 2 - Columbia and Snake Rivers Dams
Which Affect Anadromous Fish,
Columbia-North Pacific Region

Dam	Const. Started (year)	Initial Service (year)	Gross Head (feet)	Pool Length (miles)	Miles from Ocean
Columbia River					
Bonneville	1933	1938	59	45	145
The Dalles	1952	1957	86	31	191
John Day	1958	1968	105	77	216
McNary	1947	1954	75	61	292
Priest Rapids	1956	1959	77	18	397
Wanapum	1959	1963	78	38	415
Rock Island	1930	1933	34 1/	21	453
Rocky Reach	1956	1961	95	42	474
Wells	1963	1967	67	28	517
Chief Joseph 2/	1950	1955	175	51	545
Grand Coulee	1934	1941	343	151	597
Snake River					
Ice Harbor	1957	1961	98	32	334
Lower Monumental	1962	1969	100	29	366
Little Goose	1963	1970	98	37	395
Hells Canyon 2/	1961	1967	213	22	571
Oxbow	1958	1961	117	12	597
Brownlee	1955	1958	272	57	609
Swan Falls	1906	1910	24	8	780
C. J. Strike	1950	1952	88	32	816
Bliss	1948	1949	70	5	884
Lower Salmon	1910	1910	59	6	897

1/ Original head was 51 feet before Wanapum was built.
2/ Stops anadromous fish migration.

Use

Salmon and searun trout provided about 4,960,000 man-days of sport angling in 1965 (table 3). Most salmon angling takes place in the lower Columbia River, coastal streams, the Snake River and its tributaries, and coastal waters of the Pacific Ocean. Much of the steelhead trout angling occurs in lower Columbia River tributaries, but more than 300 other streams in Oregon, Idaho, and Washington provide a significant sport fishery. Angling for sea-run cutthroat trout occurs in most coastal streams.

Table 3 - Estimated Sport Use of Anadromous Fish
Columbia-North Pacific Region, 1965

	Angler-Days				
Species	Oregon1/	Washington2/	Columbia3/	Snake4/	Totals
Salmon5/	583,904	1,521,126	805,812	53,400	2,964,242
Steelhead Trout	272,931	726,750	536,540	110,600	1,646,821
Other trout6/	-	350,000	-	-	350,000
American Shad	1,800	-	14,000	-	15,800
White Sturgeon	1,300	-	47,000	12,000	60,300
Striped Bass	3,000	-	-	-	3,000
Eulachon7/					
Totals	862,935 (863,000)	2,597,876 (2,598,000)	1,403,352 (1,403,000)	176,000 (176,000)	5,040,163 (5,040,000)

1/ Oregon coast and tributaries.
2/ Puget Sound, Washington coast, and tributaries.
3/ Pacific Ocean adjacent to Columbia River; Columbia River and its tributaries to Rock Island Dam, excluding Snake River.
4/ Snake River and tributaries.
5/ Sport angling occurs for "salmon" rather than individual species; however, the bulk of the catch is chinook and coho, chinook being the more desirable species.
6/ Searun cutthroat and Dolly Varden.
7/ No data available.

Salmon and steelhead trout provided over 42 million pounds to the commercial fishery in 1965 (table 4). Salmon were harvested in the Pacific Ocean, Puget Sound, some coastal bays, and the Columbia River downstream from Bonneville Dam. Steelhead were harvested primarily from the Columbia River by Oregon commercial fishermen since Washington State law prohibits commercial harvest of steelhead.

In 1965, Indians also harvested about 1 million pounds of salmon and steelhead which were sold commercially. This fishery takes place in the Columbia River, some of its tributaries, and several of Washington's coastal and Puget Sound streams.

Sport and commercial fishing for anadromous fish is regulated to obtain maximum harvest without harm to the resource. For instance, in order to control the harvest of dwindling runs and assure upstream escapement, Columbia River commercial fishing seasons have been reduced from a high of 274 days in 1941 to a low of 77 days in 1965. Spawning escapements occasionally exceed numbers of fish needed to sustain populations commensurate with remaining spawning habitat or hatchery capacity. Such runs are not always

Steelhead, highly prized trophy. (National Marine Fisheries Service)

predictable by species or stream but efforts are made to harvest excesses whenever they occur. For instance, exceptionally large numbers of coho salmon returned to fish hatcheries in 1965. These fish exceeded the number of adults the hatcheries were capable of handling, so many were transplanted in streams not having fish runs or were used to augment existing natural populations in other streams. In addition, liberalized regulations permitted sport fishermen to catch many of the fish near the hatcheries. Some Columbia River salmon runs are dangerously low and strict protective regulations have been applied. An example is that part of the summer chinook run (originating in the Snake River) which has steadily decreased in recent years (table 5).

Sport angling for American shad, striped bass, and white sturgeon is important in local areas, however complete angler-use estimates for all species are not available (table 3). A dip net sport fishery for eulachon occurs in the Columbia, Lewis, and Cowlitz Rivers; however, catch data are not available. All of these species, with the exception of the white sturgeon, are produced primarily in the tributaries near the Pacific Ocean and in the lower Columbia River. A significant sport fishery for white sturgeon occurs in the Snake River. Commercial harvest of American shad, white sturgeon, striped bass, and eulachon totaled about 2 million pounds during 1965.

Table 4 - Estimated Commercial Use of Anadromous Fish
Columbia-North Pacific Region, 1965

Species	Commercial Fishery Landings (Pounds - round weight)1/			
	Oregon2/	Washington3/	Columbia4/	Totals
Chinook Salmon	609,000	3,926,000	6,371,000	10,906,000
Coho Salmon	3,702,000	9,437,000	5,373,000	18,512,000
Pink Salmon	179,000	4,550,0005/	54,000	4,783,000
Sockeye Salmon	-	5,995,000	25,000	6,020,000
Chum Salmon	-	1,996,000	8,000	2,004,000
Sub-totals	4,490,000	25,904,000	11,831,000	42,225,000
Steelhead Trout	-	9,8007/	510,255	520,055
Other trout6/	-	-	-	-
American Shad	518,000	1,542	354,900	874,442
White Sturgeon	-	39,000	157,977	196,977
Striped Bass	41,446	-	-	41,466
Eulachon	-	-	910,7598/	910,759
Sub-totals	559,446	50,342	1,933,891	2,543,699
Totals (rounded)	5,049,400	25,954,300	13,764,900	44,768,700

1/ Indian commercial landings included except Columbia River tributaries.
2/ Oregon coast and tributaries.
3/ Puget Sound and Washington coast.
4/ Columbia River troll and gillnet landings, both Oregon and Washington sides.
5/ Includes 3,424,100 pounds caught in the Fraser River convention area of the International Pacific Salmon Commission.
6/ Searun cutthroat and Dolly Varden.
7/ Indian commercial catch, except steelhead sold in other States.
8/ Columbia River and tributaries.

Table 5 - Average Annual Columbia River Commercial Salmon and Steelhead Trout Landings, Excluding Troll Catches, 1/ 1866-1965

Years	Average Annual Landings by Species (million pounds)					
	Chinook	Sockeye	Coho	Chum	Steelhead	Totals
1866-70	4.1	-	-	-	-	4.1
1871-75	19.4	-	-	-	-	19.4
1876-80	31.3	-	-	-	-	31.3
1881-85	39.4	-	-	-	-	39.4
1886-90	24.2	1.0	-	-	0.9	26.1
1891-95	24.2	2.4	2.4	0.3	3.7	33.0
1896-1900	23.3	1.8	3.3	0.4	2.1	30.9
1901-05 2/	28.9	0.8	1.4	1.1	0.6	32.8
1906-10	23.3	0.7	2.9	2.2	0.6	29.7
1911-15	27.0	0.9	3.5	3.0	1.9	36.3
1916-20	30.4	0.8	4.5	3.5	2.0	41.2
1921-25	22.0	1.2	6.2	2.1	2.4	33.9
1926-30	20.3	0.7	6.0	4.0	2.9	33.9
1931-35	18.2	0.3	3.4	1.1	1.8	24.8
1936-40	14.8	0.3	1.8	1.5	2.1	20.5
1941-45	16.1	0.2	1.2	2.2	1.9	21.6
1946-50	14.0	0.2	1.1	0.7	1.3	17.3
1951-55	7.7	0.3	0.7	0.3	1.5	10.5
1956-60	5.9	0.5	0.3	0.0	0.7	7.4
1961-65	4.9	0.1	0.1	0.0	0.7	5.8

1/ Troll catches are excluded because they contain an unknown proportion of salmon from Columbia River--that is, not all troll-caught salmon landed in Columbia River district ports are of Columbia River origin.

2/ Average for 1902-1905 because no species breakdown in 1901.

American shad have increased in numbers in recent years, and have extended their range up the Columbia to Priest Rapids Dam and up the Snake River at least as far as Lower Monumental Dam. Reasons for the increased numbers and extension of range are not specifically known. Shad have only recently become recognized as a sport fish in the region. Their commercial harvest is limited because of prevailing low prices and conflict with salmonid runs needing protection. Thus, maximum sport and commercial harvest of this species is not fully achieved. To what extent the run could be harvested without depressing the resource is not known.

Striped bass support a relatively new fishery on the Oregon coast and runs are not extensive or particularly large. This species is probably harvested to the maximum.

Commercial fishermen usually take white sturgeon incidentally during the salmon season and sport anglers take large numbers of these fish each year. This species probably could not withstand a significant increase in either commercial or sport harvest.

In recent years eulachon have disappeared from some streams and have steadily declined in others. Reasons for this decline have not been definitely established. This species could not withstand any significant increase in harvest.

Sport expenditures for anadromous fish amounted to about $61 million in 1965. In addition, the 1965 commercial landings had a first sale value of nearly $13 million and a processed value of more than $22 million.

In order to compare the sport and commercial fishing interests with other water uses on a monetary basis the above values are presented. However, sport fishing is influenced by esthetic values which are difficult to measure, and the evaluation presented here does not represent the true or complete worth of the resource. Viewing windows and other facilities constructed primarily for visitors are provided at all major dams having fish-passage facilities. About three million people visited anadromous fish hatcheries and ladders during 1965.

Factors Affecting Resource

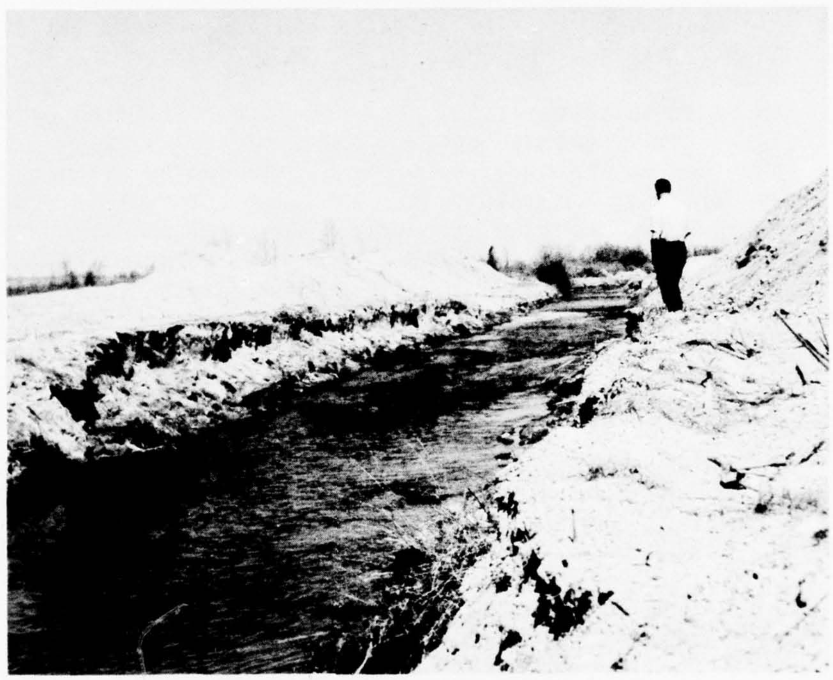
Natural limiting factors occurring at many places in the region include high water temperatures, low flows, siltation, lack of spawning gravel, competition with other fish, and barriers that prevent upstream migration.

Man-caused problems are extensive and have influenced the resource by destroying or drastically altering stream environment. The presence of dams on the Columbia River and its tributaries is a major factor limiting anadromous fish production. Impoundments have destroyed large areas of spawning habitat and, in many cases, blocked upstream migrations and/or inhibited successful downstream migrations of juveniles (table 2). More than $200 million have been spent on fish hatcheries, fish ladders, and studies to mitigate fish losses.

Impoundments also create habitat favorable to undesirable fish which prey on young migrant salmonids as well as compete directly with them for food and space. In addition, significant losses occur at turbines, spillways, and unscreened irrigation diversions.

Channeling, dredging, logging, and mining have destroyed much of the natural spawning and rearing areas by changing streambed

characteristics and altering flows. Pollution from industrial, domestic, mining, and agricultural sources have lowered water quality in many streams by introducing silt, pesticides, organic wastes, and toxins. These products often result in high water temperatures, low dissolved oxygen, and toxic waters. Water withdrawals have commonly reduced some streamflows below the point needed to sustain anadromous fish. Commercial landings from the Columbia River indicate a marked decrease in abundance of fish over the years as a result of the multitude of water development projects that adversely affect anadromous fish migrations, habitat, and survival.



Channeling restricts and sometimes eliminates spawning and rearing areas. (Washington Department of Game)

Seventy-six hatcheries rear approximately four million pounds of juvenile anadromous salmonid fish annually (figure 2). Hatchery technique has improved greatly in recent years and has resulted in large returns to the hatcheries and improved sport and commercial catches.

Spawning channels have been constructed in some areas to mitigate the loss of salmon habitat destroyed or isolated by water development projects. Varying degrees of success have been achieved, but much research remains to be done.

Pollution abatement is one step toward restoring habitat for anadromous fish in many streams. In some instances, temporary reduction of industrial waste discharge and timely water releases from water storage facilities have aided anadromous fish migrations. An excellent example of such cooperation occurred on the Willamette River in 1967 when such activities facilitated movement of fall chinook salmon through the badly polluted Portland harbor. Many problems remain but, through new legislation and public support, acceleration and expansion of pollution abatement programs will continue.

Increased emphasis on watershed management within some watersheds has resulted in improvement of water quality in streams inhabited by anadromous salmonids.

Irrigation diversions have been screened at diversion points in many areas to keep young salmonids from entering irrigated fields.

Stream barriers, such as log jams and waterfalls, are being removed or laddered in many streams to allow fish passage to upstream spawning grounds. Log jam removal is a continuing project, as floods bring more logs down the streams each year. Fish passage facilities provided at falls are usually permanent.

Resident Fish

Trout are more highly regarded by most fishermen than are other resident fish. Rainbow trout are the most widely distributed, and the most numerous. They are found in lakes and streams in every subregion, and few resident anglers need travel far to fish for them. Large numbers are raised commercially on "trout farms," and millions are stocked annually by State and Federal hatcheries. Other native resident fish are cutthroat trout, kokanee, Dolly Varden, lake trout, and landlocked coho salmon; introduced species are brook trout, brown trout, golden trout, and landlocked Atlantic salmon. The closely related grayling and mountain whitefish require coldwater habitat. Other resident species of importance to sport fishermen are burbot and walleye, found in a few lakes and streams of the upper Columbia drainage.

Most of the easily accessible trout waters are stocked with fish annually because natural production cannot keep pace with the demand.

Most low-elevation streams, and many lakes, ponds, and reservoirs support populations of warmwater game fish. These include several species of catfish, largemouth and smallmouth bass, sunfish, crappie, yellow perch, and walleye. All of these are introduced. Although excellent fishing for many of these species is available,

interest lags far behind interest in fishing for the coldwater species.

Undesirable resident species occur in most waters that are capable of supporting fish life. Many of these fish, particularly those found in cold waters, are of slight importance; others compete with or prey on game species and must be controlled or eliminated. Principal species in this category are squawfish, carp, and several species of chub and sucker.

Habitat

Resident fish inhabit all waters of the region; however, distribution of the various species is determined by habitat type. In the Columbia-North Pacific Region, trout are probably the most popular sport fish and suitable trout habitat is abundant. Cold, clear mountain streams and lakes provide most of the best habitat. Some lower elevation streams and lakes also furnish suitable habitat for trout.

Warmwater game fish require warmer waters than trout; however, habitat types frequently overlap and both groups of fish may be found in the same waters. Nongame fish occur throughout the region and are often serious competitors for food and space or are predatory on desirable species.

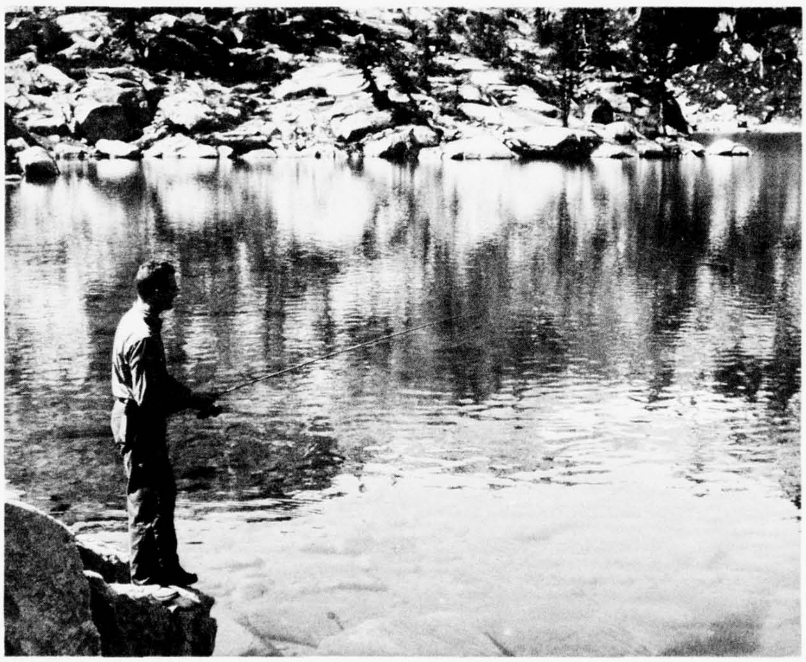
Dam construction has created many reservoirs which have eliminated stream habitat and replaced it with lake-like situations. Initially many of these reservoirs are fertile bodies of water capable of supporting substantial populations of desirable game fish. However, over a period of years this productivity declines and many reservoirs provide little or no sport fishing. This cycle can occur in as few as 5 years and is attributable to several factors including low food production because of water level fluctuations. Large populations of nongame fish soon inhabit many reservoirs and further reduce game fish numbers by competing for food and space or by preying on desirable species.

Use

Few resident species sustain commercial harvests. Several hundred thousand pounds of carp, mostly from the Columbia River basin, are sold annually, and a unique hook-and-line commercial fishery for kokanee in Lake Pend Oreille, Idaho, produces about 80,000 pounds of fish each year. Crawfish for fishbait and food are harvested commercially from a few Oregon and Washington streams and lakes.

Angling for resident fish is one of the major recreation activities in the region and is of considerable economic importance. Angler use in 1965 amounted to about 14,527,000 angler-days. Roughly $72,000,000 were spent for tackle, gear, travel, and other costs associated with fishing use. Many of the region's waters are of national as well as local importance, combining quality with great variety. The substantial esthetic values associated with fishing cannot be measured monetarily, thus the dollar figures do not represent the total value of the resource.

Sport fishing for resident salmonids exceeds natural production in most accessible waters. Less accessible waters usually have native fish populations, but generally not in numbers capable of supporting a significant increase in fishing effort. Warmwater game fish are generally underharvested and could support a significantly increased use.



Resident fish provide much angling opportunity and satisfy recreational need. (Washington Department of Game)

Factors Affecting Resource

The region contains much favorable habitat for the production of resident fish. On the other hand, many factors limit production and use of the resource. Some of these factors are subject to modification by improving the aquatic environment; some are probably not.

Low natural fertility limits the production of fish in many lakes and streams, particularly west of the Cascade Range.

Low summer and fall flows, and low seasonal water levels limit production and use of many streams, lakes, and reservoirs. For some bodies of water this is natural--there is not enough precipitation to supply large streamflows and keep ponds and lakes alive all year. For others this is caused by diversion of water for irrigation or other purposes and results from water laws that do not recognize fish and wildlife as beneficial uses of water, over-appropriation of surface water, and irrigation projects that predate the consideration of fish and wildlife as project purposes.

Poor water quality limits production in many areas. This may result from pollution by municipal or industrial wastes, agricultural chemicals, aquatic herbicides, forest insect and disease control pesticides, mine and smelter seepage and wastes, irrigation return flows which carry dissolved salts or have high silt loads, gravel or placer mining, runoff from denuded forest and agricultural land, or improper logging practices. A few lakes and ponds in closed drainage basins, particularly in central and eastern Oregon, are too alkaline to support desirable fish life.

Logging waste and erosion can block fish movement and hinder angler use. (Oregon State Game Commission)

Many reservoirs have proven to be good game fish producers. Others have promoted the growth of undesirable fish, or have proven to be poor fish producers because of a variety of limiting factors. The large Columbia River reservoirs, as an example, generally support low game fish populations. They receive very little fishing pressure, mainly because of their large unmanageable size and inaccessibility usually due to high winds.

Small impoundments have been constructed in many areas to serve as private fish ponds. Several lake-deficient areas have been supplied with impoundments through cooperative efforts of State game and fish departments and Federal conservation agencies. Several of these have become very successful trout fishing areas.

Diseases and parasites may be limiting factors in some waters, particularly in trout lakes and fish hatcheries.

Channel improvement for flood control and highway construction has destroyed trout habitat in many places.

Poor access restricts use of resident fish stocks. Part of this is due to topography. Some stream sections are too rough to fish, and many high-mountain lakes receive only occasional angler use. In most cases, however, poor access results from private ownership of lands adjacent to fishing water. In some cases streams and lakes on public land are inaccessible to the public because intervening private land is closed to access. Large areas, particularly in western Oregon and Washington, are closed to the public as municipal water supply watersheds.

Public access for sport fishing has caused State fish and game agencies and Federal land management agencies increasing concern in recent years. The problem is increasing rapidly as fishing pressure increases. Washington probably leads the States of the Columbia-North Pacific Region in furnishing public access, with developed access sites on about 240 lakes, and nearly 400 miles of shoreline easements on 89 streams.

Comparatively little habitat improvement has been accomplished except chemical eradication of undesirable fish. This has been very successful in eliminating these fish and stunted populations of warmwater game fish from some waters suitable for producing trout. This program is continuing, and poisons which are toxic only to certain species are being developed.

A small amount of stream habitat development work has been accomplished. This has mostly been bank stabilization and stream channel clearing, although a few sill logs and gabions have been installed.

Fish screens constructed to aid anadromous species have frequently benefited resident species as well.

One of the most important factors affecting survival of resident fish is the emergence of public awareness of the recreational and esthetic value of fish and wildlife resources as a facet of human environment. As a result of this public concern, recent advancements have been made in pollution control, reduction of stream destruction by highway construction, and, to some extent, consideration for fish habitat in other construction programs.

The most beneficial factor to the fish resource probably is the Federal Aid in Fish Restoration Act (64 Stat. 430) as amended (16 U.S.C. 777-777k) more commonly known as the Dingell-Johnson Act. This legislation has encouraged and enabled the respective States to meet their management and research obligations.

Marine Fish and Shellfish

Many species of marine fish are found off the Oregon-Washington coast and in the bays and estuaries. The principal species are tuna, herring, halibut, shark, flounder (several species), sablefish, rockfish, lingcod, ocean perch, and hake.

The most important crustaceans are spot, side-stripe, and pink shrimp, and red and Dungeness crab.

Ocean beaches of both Oregon and Washington supply razor clams. Horse, littleneck, cockle, softshell, butter, geoduck, quahog, and several other clams are found in bays and estuaries. Piddock, mussel, and abalone are also harvested but are less important.

Oysters are found in several of the large bays, particularly Coos, Yaquina, and Tillamook Bays, Oregon; and Willapa Bay, Grays Harbor, and Puget Sound, Washington.

Habitat

The Oregon and Washington coasts furnish varied habitat including open sandy beaches and rough rocky shorelines, broken frequently by bays and estuaries. Each type of habitat is essential to certain species and the estuaries are important to all.

These mineral and nutrient-rich areas are flushed twice each day into the open sea, and undoubtedly have a profound effect on the numbers and varieties of fish that frequent the shallow coastal waters. Some species spend their lives in these land-associated waters, while others are estuarine-dependent during only certain stages of their life cycles.

Principal estuaries in Oregon include Coos, Winchester, Alsea, Netarts, Siuslaw, Umpqua, Yaquina, and Tillamook Bays. Those in Washington are Willapa Bay, Grays Harbor, and Puget Sound.

Use

The 1965 commercial harvest was an estimated 111,600,000 pounds of marine fish and 27,000,000 pounds of shellfish.

Commercial crab harvest is significant. (Washington Department of Fisheries)

Sport fisherman use of most species of marine fish and shellfish, except razor clams, is low. Washington beaches supported a calculated 583,000 "digger-days" in 1965 for an estimated 9.2 million razor clams. Totals for Oregon beaches were much less. Practically all bays and estuaries support bay clam and Dungeness crab sport fisheries, but total use and harvest are unknown. There is also a small sport fishery for shrimp in Puget Sound. Oysters are usually found on private beds and sport harvest is low. Recreational use of all shellfish was estimated to be 1,073,000 man-days in 1965. Ocean perch, rockfish, lingcod, flounder, greenling, and other marine fish are caught from beaches, rocks, piers, and jetties the length of the coast, and there is a substantial sport fishery from boats. Recreational use of marine fish amounted to an estimated 706,000 angler-days in 1965.

The value of commercially harvested marine fish and shellfish in 1965 was about $8,500,000 and $6,400,000, respectively, to the fishermen. Recreational expenditures for marine angling amounted to an estimated $3,400,000; for shellfish harvest, $5,300,000.

Factors Affecting Resource

Many species in this group are estuarine dependent, and all are in a sense dependent on the land as the primary source of minerals and nutrients.

Estuarine ecosystems are fragile and subject to pollution from municipalities and industries that fringe them, and from the freshwater streams that feed them. Since estuaries are relatively shallow water bodies, they are prime targets for land developers who want to create relatively low-cost space by filling submersible land, and navigation interests who want to deepen channels and dispose of spoil. Since at one time much of the estuarine habitat in Washington, and some in Oregon, was sold by the States to private individuals for oyster culture, regulation and protection of these areas have been very difficult.

Encroachment on estuaries and their aquatic life is deplorable. (Oregon State Game Commission)

Estuaries have for many years served as depositories for silt and other pollutants from coastal rivers, and have been dredged, filled, and used as garbage dumps and septic tanks to the detriment of the natural resources.

The presence or absence of cover such as that supplied by kelp beds, wrecks, piers, and jetties affects species and numbers of bottomfish.

Some species, particularly oysters, have a rather narrow range of temperature tolerance. Any unnatural (artificial) increase in estuarine temperatures could change the biotic composition completely. Results are not always harmful. Higher temperatures have been beneficial in some cases.

Beach erosion and sand deposition may destroy shellfish beds.

Starfish, oyster drills, and other predators limit production of oysters in many areas.

Filling of tidelands has not so seriously reduced estuarine habitat as it has in some other areas, but there has been a steady attrition.

Domestic and industrial pollution, particularly wastes from pulp and paper mills, and food processing plants, adversely affects aquatic habitat in many areas.

Big Game

The big game resources include populations of Rocky Mountain and Roosevelt elk, moose, black-tailed, white-tailed, and mule deer, pronghorn antelope, bighorn sheep, mountain goat, mountain caribou, black and grizzly bear, and mountain lion.

Habitat

Elevation ranges from sea level to over 14,000 feet, and the precipitation from less than 8 to more than 150 inches. The varied climate and topography result in habitat suitable for a wide range of big game species. The forested portion supports the greatest numbers and variety. Elk and black bear are found in the forests of each subregion, particularly in cutover and burned areas. Mule deer are in forests of all subregions but the number west of the Cascade summit is very small. These animals also range into deserts and broken lands away from forests.

White-tailed deer are found in bottomland brush and timber in all subregions except Oregon Closed Basin, Yakima, and Puget Sound.

Black-tailed deer habitat is optimum in cutover and burned areas west of the Cascade summit. Small numbers extend into mule deer range along the Cascade crest, and intergradation of the two species is common.

Moose occur in brush and timber areas in the northeastern corner of the region and occasionally in the North Cascades. Grizzly bear range is about the same. A small herd of caribou persists in extreme northern Idaho and northeastern Washington.

Mountain lion are in at least eight of the subregions in both timbered and open areas, but are generally restricted to rough topography far from human concentrations.

Mountain goat occupy high, steep mountain terrain in all subregions except Coastal, Willamette, and Oregon Closed Basin.

Bighorn sheep are in rough, broken country in Clark Fork-Kootenai-Spokane, Upper Snake, Central Snake, Lower Snake, Oregon Closed Basin, Yakima, Upper Columbia, and Mid Columbia Subregions.

Pronghorn antelope occupy relatively smooth, open prairie and desert lands in the same subregions as bighorn sheep, except Upper Columbia.

Use

An estimated 4,600,000 man-days were expended for big game hunting in 1965. About 97 percent of this total was for deer and elk. Mule deer furnished the most hunting, about 1,700,000 man-days, with elk a close second, approximately 1,500,000 man-days.

While some other big game species supply fewer man-days of hunting, their importance is not diminished, since there is a large demand for the available supply.

Sportsmen's expenditures for big game hunting amounted to about $50,000,000 in 1965.

Deer furnish quality hunting. (Oregon State Game Commission)

Factors Affecting Resource

Numbers of black-tailed deer, mule deer, elk, and pronghorn have increased dramatically in many parts of the region in the last 50 years. Mountain goat, bighorn sheep, white-tailed deer, and mountain lion numbers have remained nearly constant for each species.

Two factors affecting numbers of deer, elk, bear, and other species are forest cutting and forest fire, which have similar effects so far as big game animals are concerned. Excellent big game habitat persists for a 15- to 20-year period after cutting or fire. Thereafter, until the forest is again cut or burned, it becomes increasingly less desirable habitat.

Overharvest and underharvest are factors influencing the production of big game. Overharvest destroyed the great herds of bison and was primarily responsible for reducing the numbers of several other species to the remnant populations of 50 years ago. With present knowledge and strict regulation, this is no longer a serious limiting factor except in very localized areas.

Underharvest has been a major problem on many ranges and continues to be a problem in some areas although improvements in range management, increased accessibility of formerly remote ranges to hunters, and more sophisticated techniques for distributing harvest have improved the situation. Usually, the problem is the result of an imbalance between summer and winter range. This imbalance has been compounded in most areas by the location of winter range, which is normally at low elevation. It is thus usually more productive per unit than summer range, so it is more desirable range for livestock. It is also a preferred location for residential, agricultural, and industrial development. These conflicts have inevitably led to decreases in big game.

Insufficient winter feed takes its toll. (Oregon State Game Commission)

Diseases and parasites affect populations of big game animals at times. This is usually related to nutritional problems. Sheep scabies was probably the direct cause of the extermination of the desert bighorn. Endemic disease may still be limiting sheep populations, but prospects for disease-caused major dieoffs of any range species are fairly remote under present range management and harvest regulation.

Transplanting animals to areas outside occupied ranges has sometimes proven successful for some species, particularly elk and bighorn

sheep, which had been reduced to small populations by the turn of the century.

Predators may have beneficial effects on population levels of some prey species.

Development of water supplies, either for livestock or specifically for game, has helped to increase populations of mule deer in several water-deficient areas. Other water developments have inundated important winter ranges, created barriers to migration, and caused losses by drowning in canals.

Perhaps the most beneficial factor affecting big game is the Federal Aid in Wildlife Restoration Act (50 Stat. 917) as amended (16 U.S.C. sec. 669-669i) more commonly known as the Pittman-Robertson Act. This legislation has enabled the States to finance the various management, research, and acquisition projects necessary to assist perpetuation of the animals involved.

Upland Game

The region supports many species of upland game, some native, some introduced. These include ring-necked pheasant, Hungarian partridge, chukar, bobwhite, mountain, valley, and Gambel's quail, ruffed, blue, spruce, sharp-tailed, and sage grouse, ptarmigan, turkey, cottontail, brush rabbit, snowshoe rabbit, and other rabbits and hares. Other species, such as marmot and raccoon, have recently been granted upland game status in some States.

Ring-necked pheasant, Hungarian partridge, bobwhite, chukar, and turkey were introduced. Trial introductions of other species are underway.

Habitat

Ring-necked pheasant have been introduced and spread into farmland in all subregions. The largest populations are associated with irrigated lands in semi-desert portions of the region, particularly central Washington, eastern Oregon, and southern Idaho. Parts of the dryland farming areas of Upper Columbia, Yakima, Mid Columbia, Lower Snake, and Willamette Subregions also support fairly high populations.

Hungarian partridge inhabit farm and range lands in all subregions east of the Cascade Range. They are locally numerous but are usually hunted incidental to other species.

The chukar is the most successful of recently introduced game birds and occupies rough, broken, cheatgrass ranges in the same subregions as Hungarian partridge except in western Montana.

A limited number of bobwhite are found in farmed areas in Upper Columbia, Yakima, Central and Lower Snake, and Willamette Subregions. The few bobwhites killed by hunters are taken mainly incidental to hunting for pheasant or other quail. The region's Gambel's quail population is found in a small area near Salmon, Idaho.

Valley quail, as a result of widespread introduction and adaptability, are found in all subregions, particularly in areas where farmland, brushland, and pastureland are well interspersed. Mountain quail are generally in foothill cutover or brushy lands, particularly around clearings. They occur in all subregions except Clark Fork-Kootenai-Spokane and possibly Upper Columbia.

Blue and ruffed grouse occur in timbered areas of all subregions. Spruce grouse are in thickly-timbered areas of the Washington Cascades, and the Clark Fork-Kootenai-Spokane, and Upper, Central, and Lower Snake Subregions. Sharp-tailed grouse were formerly abundant and still persist where suitable prairie habitat is found in Clark Fork-Kootenai-Spokane, Upper Columbia, Yakima, and Upper, Central, and Lower Snake Subregions. Sage grouse is another species much reduced in range and numbers. It occurs in the same subregions as sharp-tailed grouse, plus Oregon Closed Basin, and is mostly in sagebrush areas.

Band-tailed pigeon nest in, and migrate through, timber and brushlands of the Coast Range and the west side of the Cascades. A small amount of band-tailed pigeon habitat also exists east of the Cascades in subregions 2, 3, and 7. Mourning dove are in all subregions during migration periods and as nesters. They occur at fairly low elevations and frequent tree and brush areas, farmlands, and homesteads.

Silver grey squirrel are in timbered and brushy areas along the Coast Range and Cascades in Oregon. They are also becoming rather abundant in Willamette Basin near nut orchards. In Washington they may be found as far north along the Cascades as southern Puget Sound and Lake Chelan.

Ptarmigan are found in limited numbers at high elevations in the North Cascades and Northern Rockies.

Wild turkey have been introduced into several areas and appear to be successful in woodland-brushland-grassland ranges in Clark Fork-Kootenai-Spokane, Yakima, Mid Columbia, Central Snake, and Lower Snake Subregions.

Use

Roughly 3,650,000 hunter-days were expended on upland game in the region in 1965. Estimated sportsmen's expenditures were $16,900,000.

Ring-necked pheasant were the most popular upland game in terms of use with 1,600,000 hunter-days; grouse of all species, 670,000; quail of all species, 363,000; chukar, 247,000; and dove, 225,000.

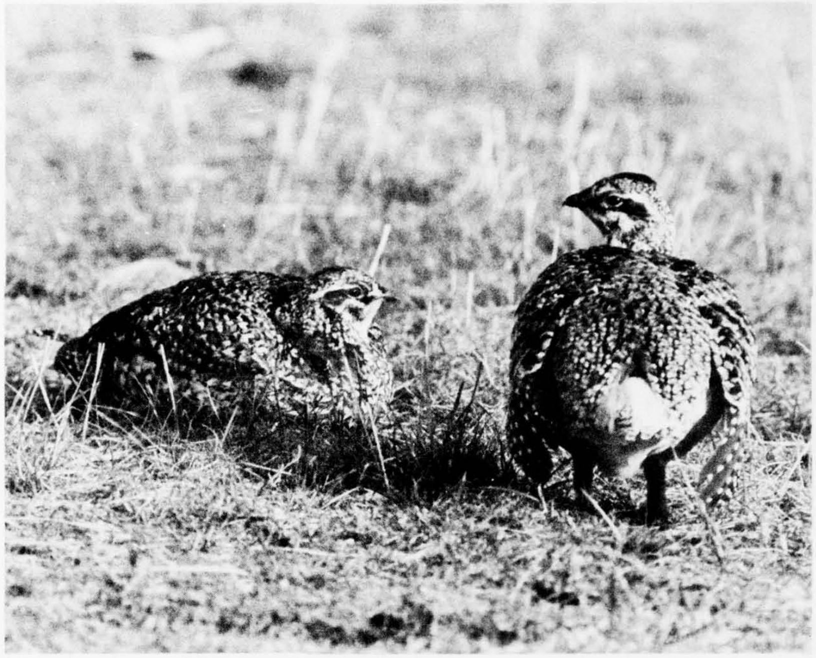
More hunter-days were expended on pheasants than on any other upland game species in every subregion except Clark Fork-Kootenai-Spokane, Lower Columbia, Coastal, and Puget Sound, where grouse led; and Oregon Closed Basin where rabbits were more important.

Factors Affecting Resource

Most upland game species are very short-lived and capable of rapid replacement. Overhunting is usually not a factor causing population decline. Numbers may fluctuate widely from year to year, or even from season to season, because of subtle changes in environment.

Since most heavily-hunted game birds are produced on farm and range lands, agricultural practices affect populations. Irrigation in semi-desert areas has greatly increased numbers of pheasant, quail, and probably other species. On the other hand, conservation of grassland to cropland has eliminated habitat for native grouse and other species. Gravity irrigation in particular has been of overall benefit to upland game in most areas because ditches, drains, seeps, and other "waste" areas, diversified crops, and generally small fields have contributed to "edge" and provided a variety of food and cover. Sprinkler irrigation, which has replaced gravity irrigation in many areas, has not been nearly so effective in providing upland game habitat.

Increases in the operation costs plus the development of more efficient farm machinery have forced more intensive use of farmland including the elimination of vegetated fence lines, "waste" areas, and field borders. The increased use of herbicides for weed control has eliminated much habitat, particularly along ditch banks. Misuse of pesticides has had adverse effects on farm game populations. Field burning produces wildlife deserts in several areas, particularly in parts of Oregon's Willamette Valley.



Sharp-tailed grouse have suffered serious habitat losses from agricultural activities. (Montana Department of Fish and Game)

In some areas drainage of natural wetlands has reduced upland game populations. Use of high-speed machinery for harvesting alfalfa, and increased use of corn for silage have decreased pheasant production in several areas.

Overgrazing of range and pasture lands limits numbers of several species. Development of stockwater facilities has benefited several species, particularly grouse, Hungarian partridge, and chukar. Complete removal of sagebrush from large areas of range, a currently fashionable range-improvement practice, will reduce sage grouse populations. If patches of brush are left, however, the practice may benefit several species.

Logging generally benefits upland game by permitting growth of understory vegetation. Practices that lead to accelerated erosion and loss of topsoil are harmful.

The habitat available to upland game is being destroyed piecemeal by construction of roads, airports, and industrial plants. Urban sprawl has eliminated much habitat and resulted in hunting restrictions on additional habitat not physically affected by construction. Most water-development projects destroy upland game habitat.

Certain practices for increasing numbers and harvest of upland game have been instituted. These include planting food and cover and installing water collecting devices on public and private land, cooperating with landowners to assure public access for hunting, working with construction agencies to reduce unnecessary habitat losses, purchasing land for habitat development and public hunting, and publicizing poor land use practices that lead to environmental deterioration.

Pheasant are stocked for hunting in several areas, particularly near population centers west of the Cascade Range.

Fur Animals

Fur animals include badger, beaver, bobcat, coyote, red, grey, and kit fox, fisher, lynx, marten, mink, muskrat, nutria, opossum, raccoon, ringtail, river otter, spotted and striped skunk, weasel, and wolverine. Pelts of rabbit, mountain lion, bear, and feral cat may also reach the market.

Habitat

Almost every square mile of the land area supports one or more fur animal species. Beaver, mink, muskrat, nutria, raccoon, and river otter are usually not found far from water and are usually at relatively low elevations. Badger, bobcat, coyote, and kit fox are animals of the open prairies and rough broken land. Fisher, lynx, marten, mountain lion, and wolverine are wilderness animals. Red and grey foxes, opossum, and spotted and striped skunks are usually animals of the farmlands although the red fox and weasel may live at relatively high elevations.

Use

Trapping has declined steadily since 1946. Most of this decline is probably the result of low fur prices, although the rural-to-urban migration, and generally healthy economy have decreased the number of trappers.

Muskrat are the most commonly trapped animals, but beaver usually furnish pelts of most value collectively. River otter and beaver usually bring the highest prices per pelt. An estimated 210,000 pelts with a raw fur value of $743,000 were harvested during the 1965-1966 season.

Most of these species are not being harvested to the greatest degree possible. Some, however, such as fisher and wolverine, have become extremely rare and are afforded protection over much of the region.

Muskrats support heavy trapping pressure. (Bureau of Sport Fisheries and Wildlife)

Factors Affecting Resource

Historically, the fur market has probably been the factor with the greatest effect on the resource. However, current fur prices are so low for most species that trapping tends to be a sport rather than a business, and environmental factors now limit populations of most species. Factors affecting waterfowl and upland game resources usually affect fur animal resources as well. If waterfowl habitat is created or destroyed, so is habitat for mink, muskrat, raccoon, nutria, opossum, weasel, and skunk. Elimination of fence rows and "waste" areas, important habitat for upland game, may also eliminate weasel, skunk, fox, and badger.

Water pollution destroys or degrades habitat for beaver, mink, muskrat, raccoon, and others.

Since many fur animals are predaceous, pesticides may indirectly limit production of some species. Disease, predation, and predator control may also limit populations.

Opossum and nutria, two relative newcomers, are spreading rapidly, and are competing with more desirable species for some habitat.

Waterfowl

The region is host to many species of waterfowl. Some are yearlong residents, some nest here, some migrate through, and some winter here.

Although certain species may be more numerous locally, the mallard is probably the most important waterfowl in terms of hunter interest, followed by the Canada goose in its several varieties. Other species that enter the bag are pintail, gadwall, American widgeon, green-winged teal, blue-winged teal, cinnamon teal, shoveler, wood duck, redhead, ring-necked duck, canvasback, lesser scaup, common goldeneye, bufflehead, ruddy duck, white-fronted goose, lesser snow goose, black brant, and coot.

Barrow's goldeneye, oldsquaw, harlequin, white-winged, surf, and common scoters, hooded, common, and red-breasted mergansers, European widgeon, Ross's goose, and whistling and trumpeter swans also occur.

Habitat

Although the region produces large numbers of ducks and fairly important numbers of geese and swans, it is primarily important for supplying habitat used during migration periods.

The region contains 21 national wildlife refuges and many State-owned or -managed areas primarily dedicated to the conservation of waterfowl. These are, of course, important habitat areas.

Puget Sound Subregion has many bays, estuaries, and lakes that supply habitat for ducks and geese, particularly diving ducks and black brant. Bays and estuaries of the Coastal Subregion supply similar habitat.

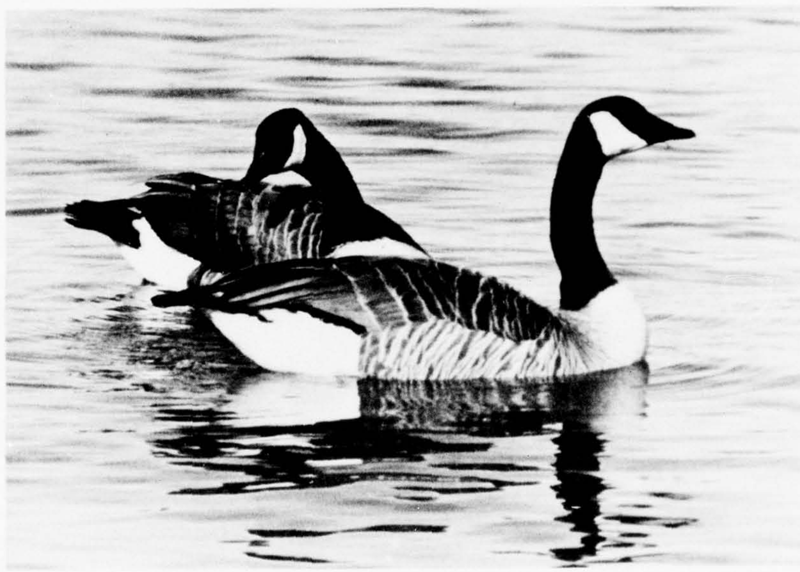
Summer, Silver, and Malheur Lakes, the lakes of Warner Valley, and other large shallow lakes and marshes of the Oregon Closed Basin are nationally famous waterfowl habitat.

Much of Willamette Valley's once-abundant wetland habitat has been drained for agriculture, but the river and remaining lakes and marshes of the valley are still important habitat for ducks. The valley also provides the only wintering ground for dusky Canada geese.

The Columbia and Snake Rivers with their associated irrigated and dry-farmed areas are hosts to millions of ducks, geese, and swans annually, particularly in central Washington and southern Idaho.

Use

An estimated 1,436,000 man-days were spent hunting waterfowl in 1965. Hunters' expenditures were about $10 million. The Upper Columbia Subregion received the greatest use by waterfowl hunters, 276,000 man-days, reflecting the large amount of natural waterfowl habitat and the complex of seeps, marshes, reservoirs, and waterfowl food crops created by the Columbia Basin Project. Puget Sound was second with 208,000 man-days, followed by the Upper and Central Snake with 176,000 and 156,000 man-days, respectively.



Canada geese are high on the waterfowl hunter's list of preferred species. (Bureau of Sport Fisheries and Wildlife)

Factors Affecting Resource

Since most waterfowl migrate they are affected by factors such as drainage of wetlands, or flooding of habitat, that occur outside this region.

Neither drainage nor flooding has been of serious overall importance in the region; however, there have been considerable

waterfowl habitat losses from agricultural drainage in the Willamette Basin, Puget Sound, and Lower Columbia Subregions, and loss of Canada goose nesting habitat from reservoir construction on the Columbia River.

The greatest impact factor on waterfowl resources has probably been the irrigation of semi-desert lands along the Snake River in southern Idaho and eastern Oregon, the Yakima River in central Washington, and more recently the diversion of water and irrigation of lands in Washington under the Columbia Basin Project. These areas, and the last free-flowing portion of the Columbia River in the Hanford Atomic Energy Commission Reservation, host the bulk of wintering mallards in the Pacific Flyway. The profusion of ditchbank cover, waste water, grain-crop residues, and unmolested open water in winter has made these areas attractive to waterfowl. However, intensive agricultural practices can adversely affect waterfowl production and wintering capacities on irrigated farmlands.

Many reservoirs are too deep, cold, unproductive, and/or far from food supplies to be good waterfowl habitat. A few exceptions would be reservoirs supplied from Franklin D. Roosevelt Lake in Washington, certain reservoirs in southern Idaho, and McKay, Cold Springs, and Fern Ridge Reservoirs in Oregon.

The establishment of waterfowl refuges and management areas, including several connected with irrigation, flood control, and hydroelectric power developments, has benefited the resource and helped distribute hunter use.

Moderate livestock grazing around and near wetlands usually benefits waterfowl and fairly heavy grazing of certain areas may benefit grazing geese and ducks. Overgrazing, however, or grazing during certain seasons may destroy nesting cover and desirable grasses.

Predation of waterfowl nests is probably a major factor limiting production in some areas, particularly where habitat is deteriorating.

The single most beneficial factor related to waterfowl of the subregion is the Federal Aid in Wildlife Restoration Act that has enabled participating States to initiate and carry out a variety of important tasks. These Pittman-Robertson programs related to land acquisition, development, and research have done much to enhance waterfowl conditions.

Other Wildlife

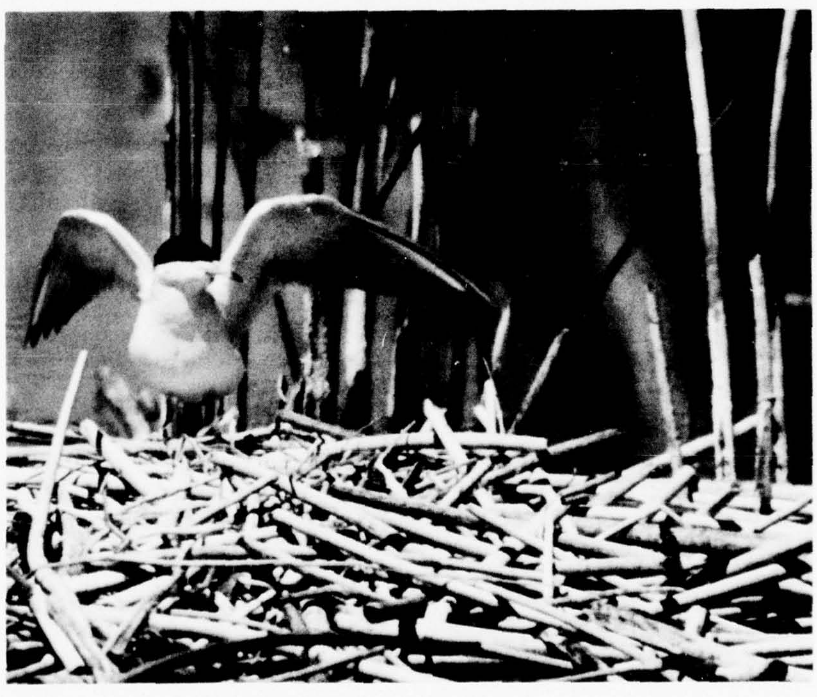
The list of species in this category varies from State to State depending to some extent on legal definitions. Generally it includes jack rabbit; fur animals that are hunted such as fox, raccoon, and coyote; rodents except beaver, muskrat, squirrel, and nutria; unprotected rapacious and nuisance birds; most reptiles and amphibians; nongame birds; feral pigeon, cat, pig, and goat; seal and sea lion; and other animals not otherwise categorized.

Habitat

Some animals of this group are found throughout the region with the possible exception of parts of some glaciers and barren peaks.

Use

These animals are mostly valuable for viewing. People like to watch most birds and animals. Some are harvested for sport and food, as frogs are. Others are hunted for sport or to control damages--crow and ground squirrel are examples. Some, particularly the rodents, may damage crops and foodstuffs. Pelts of a few species enter the fur market, and some are collected and sold by biological supply houses.



Various species of birdlife, such as Forster's tern, contribute to man's enjoyment of his environment. (Bureau of Sport Fisheries and Wildlife)

The amount of hunting use these species receive is unknown although about 10 percent of all hunter use is usually estimated for nongame species.

Factors Affecting Resource

Many of the natural limiting factors, man-caused problems, and various beneficial developments affecting other faunal groups also influence "other wildlife" resources.

APPRAISAL OF FUTURE NEEDS

The purpose of this section is to quantify the future need for fishing and hunting by establishing projections which are expressed as demands. Sport fishing and hunting demand may be defined as the number of fisherman-days or hunter-days that will be required for the use of the population. Demand for commercial fish is the pounds of fish that will be required to supply the markets of the future. Future need as used in this appraisal equals projected demand minus present use.

Sport fishing demand is projected to increase 157 percent from about 21 million user-days in 1965 to 54 million user-days in 2020. Hunting demand is projected to increase 111 percent from about 10.5 million user-days in 1965 to over 22 million in 2020. These increases represent needs of about 33 million angler-days and almost 12 million hunter-days. Figure 4 presents a graphic analysis of fishing and hunting demand in the region.

Angler-use estimates for 1965 were based upon information provided by the States of Idaho, Montana, Oregon, and Washington. Projected fishing use was determined by correlating 1965 use with estimated trends in regional human population and increased per capita participation. Human population data were provided by the Columbia-North Pacific Economics Work Group, Appendix VI. The estimated increase in individual participation rates was calculated from the data presented in the Bureau of Sport Fisheries and Wildlife 1965 National Survey of Fishing and Hunting. The commercial harvest of fish was projected to be at the same ratio to sport harvest as in 1965.

Hunting needs were projected by determining the 1965 level of hunter-days per capita by State. The factor derived was applied to projected increase in State human population figures at target years thus giving State hunting needs. Breakdown from State to subregion or portion of a subregion was on the same ratio or percentage as occurred in 1965.

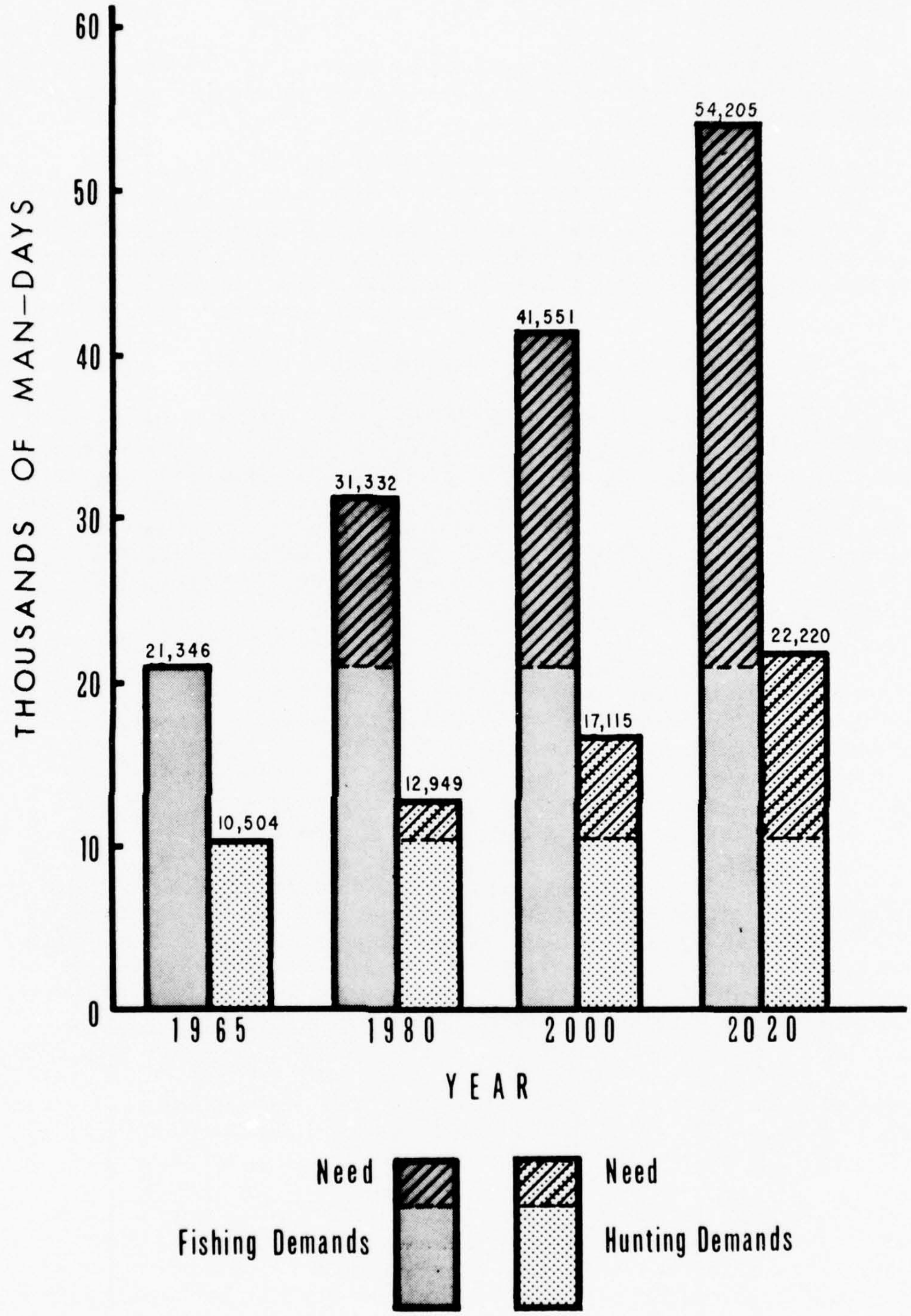


Figure 4. Projected demand for sport fishing and hunting, Columbia-North Pacific Region

Several factors are expected to contribute to the higher increase in fishing effort than hunting:

(a) Fishing trips are becoming increasingly a family recreation activity without restrictions on age or sex, while hunting appeals primarily to the adult male segment of the population. Age differential is governed partially by law, because most States have minimum requirements for hunters that do not apply to fishermen. In addition, the physical exertion required in some types of hunting may exclude some women and elderly men, while these same individuals are capable of some types of fishing.

(b) Fishing is primarily a summer activity that corresponds to popular family vacation periods. Hunting, on the other hand, is confined primarily to four or five fall and winter months.

(c) Hunting also requires large tracts of land and consequently often conflicts with other land or water uses. By contrast, access to fishing waters, especially with increased boating use, requires very little land and fishing seldom conflicts with other land or water uses.

(d) Urbanization has probably contributed to a lack of exposure to hunting and hunting skills while having little or no effect on introductions to fishing. Fishing opportunities often exist within city limits, and most urban dwellers are eventually exposed to some form of angling.

These factors and many others, such as competition with popular spectator sports, more costly capital investments in basic hunting equipment, and less return per unit of effort, may influence the growth-rate difference between fishing and hunting participation.

A lack of adequate data precludes meaningful estimates of future needs for other than fishing and hunting, e.g., wildlife observation and study and wildlife photography. However, participation in these activities already surpasses hunting and fishing in some areas and will probably increase more rapidly than hunting and fishing in future years.

The need to provide increased hunting and fishing generally will indicate a need for additional fish and wildlife and additional habitat. This is the extent that any translation can be made. Amounts cannot be estimated. Use figures can be measured or estimated, but for the most part, present fish and wildlife populations cannot be accurately determined. In other words, the exact correlation between fish and wildlife populations and amount of fishing and hunting they provide is not generally known. Therefore, it is not practicable to estimate numbers of animals needed

to satisfy future man-day use. Fish and wildlife habitat varies considerably in quality and quantity and is always changing. Therefore, neither is it practicable to estimate the acres of water or land necessary to produce a certain population of fish or wildlife that in turn might provide a certain number of days fishing or hunting. Measures needed to develop or increase populations of fish and wildlife are included under "Means to Satisfy Needs."

Fishing

Table 6 shows the future demand and need for sport and commercial fishing for the various groups of fish. Fishing use and projections are indicated by related groups since the demand is specific. Tables 7, 8, and 9 present sport fishing demand and need by subregion. Fishing demands and needs for anadromous fish are not presented by subregion because anadromous fish are a regional resource, and production and harvest areas are often widely separated.

Table 6 - Projected Demand and Need for Sport and Commercial Fishing for all Groups, Columbia-North Pacific Region

Group	1965	1980		2000		2020	
	Use	Demand	Need	Demand	Need	Demand	Need
Sport (1000 user-days)							
Anadromous fish	5,040	8,670	3,630	11,492	6,452	15,070	10,030
Resident fish	14,527	20,191	5,664	26,785	12,258	34,866	20,339
Marine fish	706	980	274	1,299	593	1,694	988
Shellfish	1,073	1,491	418	1,975	902	2,575	1,502
Total user-days	21,346	31,332	9,986	41,551	20,205	54,205	32,859
Commercial (1000 pounds)							
Anadromous fish	44,769	76,999	32,230	102,073	57,304	133,858	89,089
Resident fish 1/							
Marine fish	111,619	155,150	43,531	205,379	93,760	267,886	156,267
Shellfish	27,053	37,604	10,551	49,778	22,725	64,927	37,874
Total pounds landed	183,441	269,753	86,312	357,230	173,789	466,671	283,230

1/ No estimates were made since the commercial fishery for resident fish is negligible.

Table 7 - Projected Sport Fishing Demand and Need for Resident Fish in the Subregions

Sub-region	1965 Use	1980 Demand	1980 Need	2000 Demand	2000 Need	2020 Demand	2020 Need
	(1000 user-days)						
1	1,510	2,099	589	2,793	1,283	3,624	2,114
2	2,704	3,758	1,054	4,975	2,271	6,489	3,785
3	753	1,047	294	1,386	633	1,807	1,054
4	705	980	275	1,297	592	1,692	987
5	610	848	238	1,122	512	1,464	854
6	686	953	267	1,269	583	1,646	960
7	1,047	1,456	409	1,927	880	2,514	1,467
8	679	944	265	1,250	571	1,631	952
9 1/	994	1,381	387	1,828	834	2,385	1,391
10	1,200	1,668	468	2,208	1,008	2,880	1,680
11 1/	3,510	4,878	1,368	6,493	2,983	8,424	4,914
12	129	179	50	237	108	310	181
Totals	14,527	20,191	5,664	26,785	12,258	34,866	20,339

1/ Projected figures for Subregions 9 and 11 differ from data presented in the Willamette and Puget Sound Type 2 studies. This is because the C-NP analysis is "State" oriented while Type 2 studies are confined to a smaller study area, use different human population estimates, etc.

Table 8 - Projected Sport Fishing Demand and Need for Shellfish in the Subregions 1/

Sub-region	1965 Use	1980 Demand	1980 Need	2000 Demand	2000 Need	2020 Demand	2020 Need
	(1000 user-days)						
10	952	1,323	371	1,752	800	2,285	1,333
11	121	168	47	223	102	290	169
Totals	1,073	1,491	418	1,975	902	2,575	1,502

1/ Significant use occurs only in Subregions 10 and 11.

Table 9 - Projected Sport Fishing Demand and Need for Marine Fish in the Subregions[1/]

Sub-region	1965 Use	1980 Demand	1980 Need	2000 Demand	2000 Need	2020 Demand	2020 Need
	(1000 user-days)						
10	633	879	246	1,164	531	1,519	886
11	73	101	28	135	62	175	102
Totals	706	980	274	1,299	593	1,694	988

1/ Use occurs only in Subregions 10 and 11.

Hunting

Table 10 presents hunting demand and need by subregion and regional total. All types of hunting endeavors were consolidated and considered as one sport in calculating future demand and need; however, in satisfying future needs, hunting for one group of wildlife such as upland game may not be substituted for another such as big game. Within each subregion, future demand for each wildlife group will be generally in proportion to present use.

Table 10 - Projected Hunting Demand and Need in the Subregions

Sub-region	1965 Use	1980 Demand	1980 Need	2000 Demand	2000 Need	2020 Demand	2020 Need
	(1000 user-days)						
1	825	986	161	1,265	440	1,607	782
2	1,369	1,709	340	2,279	910	2,978	1,609
3	619	770	151	1,023	404	1,333	714
4	940	1,106	166	1,391	451	1,736	796
5	1,087	1,313	226	1,702	615	2,176	1,089
6	1,419	1,749	330	2,311	892	2,998	1,579
7	1,022	1,279	257	1,719	697	2,261	1,239
8	405	506	101	677	272	886	481
9[1/]	854	1,071	217	1,446	592	1,908	1,054
10	948	1,191	243	1,605	657	2,115	1,167
11[1/]	858	1,071	213	1,429	571	1,868	1,010
12	158	198	40	268	110	354	196
Totals	10,504	12,949	2,445	17,115	6,611	22,220	11,716

1/ Projected figures for Subregions 9 and 11 differ from data presented in the Willamette and Puget Sound Type 2 studies. This is because the C-NP analysis is "State" oriented while Type 2 studies are confined to a smaller study area, use different human population estimates, etc.

MEANS TO SATISFY NEEDS

The following presents measures that will help to satisfy future angler and hunter demands.

Fishing

The region's sport fishing needs are projected to increase to about 10 million angler-days per year by 1980, 20 million by 2000, and 33 million by 2020. This includes recreational needs for anadromous, resident, marine, and shellfish species. Commercial harvest needs for anadromous and marine fish and shellfish will increase to about 86 million pounds by 1980, 173 million by 2000, and 283 million by 2020.

Satisfaction of future fishing needs will depend upon providing both quantity and quality fishing experiences. This may include increased numbers or size of fish, more intensive use of some species, and more fishing areas. Of major importance will be habitat preservation and enhancement, improved access, artificial propagation, and maintenance of certain natural fish stocks.

Habitat Preservation

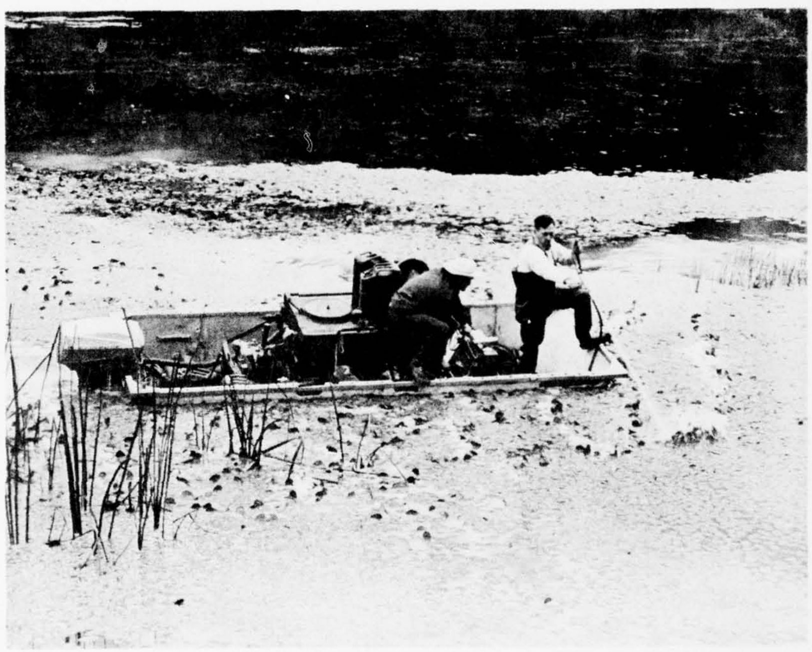
Remaining natural aquatic habitat must be preserved now to maintain the existing level of use and to retain a resource base

Free flowing rivers are highly essential to fish resources and the angling they support. (Idaho Fish and Game Department)

for fisheries management to meet increasing needs. Rivers and smaller streams should remain in a natural free-flowing state to preserve their special habitats and to retain the high quality angling only they provide. All major river systems and many of their tributaries should be preserved to permit natural propagation of anadromous and resident fish. Each subregion section of this appendix lists streams recommended for preservation. The region's remaining estuarine habitat also should be protected and enhanced. A list of these valuable bays and estuaries appears in the Coastal Subregion section. These waters should be protected from such alterations as channel changes, land fills, pollution, and thermal contamination.

Habitat Improvement

There are habitat improvement opportunities and wide variety of measures recommended to help expand the habitat base. Stream barriers, such as logjams and impassable falls and culverts, should be removed or fish passage facilities provided to increase the amount of spawning area available to anadromous fish. Many of these barriers are known and are identified in some of the subregion



Rehabilitation of various waters creates a balanced environment for fish. (Oregon State Game Commission)

sections of this appendix. Passage facilities at a number of man-made barriers also would benefit migrating fish. Water pollution should be abated to improve water quality and increase fish production. Streamflows should be increased or regulated on many streams to restore, improve, or maintain habitat. Gradient-reducing devices should be installed in some streams. In some subregions, small fishing impoundments should be constructed where they would not eliminate existing stream fisheries or wildlife values. Other measures that should be implemented where appropriate include: chemical control of undesirable fish, development of spawning beds in streams, fertilization of some lakes, introduction of beneficial aquatic plants and food organisms, construction of fish shelters, removal of debris, and control of aquatic weeds.

Details concerning the quantity of these measures, their costs, and benefits are largely unavailable. They are presented to the extent possible in the subregion sections of this appendix. A summary of fish habitat improvement means proposed by Federal and non-Federal agencies is shown in table 11. These proposals are presented in the subregion chapters.

Greater Harvest

Little opportunity exists for increasing the harvest of existing stocks of anadromous fish. The stocks are presently being used to capacity. The harvest could be increased during years of abundant migrations by increasing the length of seasons or liberalizing other regulations. Providing public access to some waters that are difficult to reach would help to satisfy some of the increasing need for cold-water resident fish. Additional angler access should also be provided at many lakes and streams to increase angling for warmwater fish. Access to saltwater areas should also be improved to support increased fishing needs for marine species.

Augmentation of Supply

One of the primary means for increasing production of anadromous fish in the future will be artificial propagation. Hatcheries, incubation channels, and spawning channels will become more and more important as the demand increases. Spawning channels have had limited success; however, studies may suggest methods to improve production and indicate species most conducive to this type of management. Incubation channels can contribute significantly to fish populations.

Table 11 - Fish Habitat Improvement Means, Columbia-North Pacific Region

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Stream improvement	mile	1,683	2,779.0	2,214	3,678.0	2,043	3,352.0
Spawning bed improvement	mile	654	4,758.3	579	908.5	672	1,032.9
Rough fish removal (streams)	mile	2,980	6.7	2,418	4.4	2,418	4.4
Rough fish removal (lakes)	acre	13,196	12.9	18,510	17.2	19,285	16.9
Stream channel preparation	mile	170	1,179.0	260	1,961.5	256	2,221.0
Lake improvement	acre	10,606	7,477.0	13,722	9,559.7	13,382	9,305.3
Totals			16,212.9		16,129.3		15,932.5

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement							
Stream	mile	3,491 1/	49,209 2/	6,150 1/	40,053 2/	7,230 1/	37,025 2/
Lake	acre	90,837 3/	29,621 4/	111,350 3/	20,763 4/	131,673 3/	29,556 4/
Fish lakes	acre	9,498	13,715	13,028	18,695	13,888	22,225
Totals			92,545		79,511		88,806

1/ Incomplete listing of distance. Includes improved flows, streambank revegetation and stabilization, structural improvements in streambeds, stream improvement, and nongame fish control.
2/ Includes lake habitat improvement cost.
3/ Includes nongame fish control.
4/ Includes stream habitat improvement cost.

Salmon hatcheries are a vital link in anadromous fish production. (National Marine Fisheries Service)

Artificial propagation of resident salmonids is necessary to augment natural stocks of fish to supply present needs. This is true in reservoirs where very few natural spawning areas are available. A more intensive stocking program for rainbow trout, kokanee, and coho salmon will need to be maintained in the future. Developing spawning channels and rearing ponds adjacent to large reservoirs may provide additional inexpensive stocks of high quality fish.

New and better techniques of rearing salmonids in hatcheries are being developed and should continue throughout the future as the need grows. Sites for new and larger hatcheries should be identified and reserved for future construction.

Hunting

Hunting needs are projected to amount to about 2.4 million man-days by 1980, 6.6 million by 2000, and 12 million by 2020. This includes hunting needs for big game, upland game, waterfowl, and other wildlife.

Means of providing more hunting in the future will involve four general management methods. The first two, habitat preservation

and habitat improvement, will be aimed at sustaining and increasing natural production; the third, greater harvest of the existing resource, will obtain more hunting per animal than now realized; and the fourth, augmentation of supply, will make use of such means as artificial propagation and artificial feeding.

Habitat Preservation

Preservation of key habitat is of major importance in satisfying the present level of use and providing a habitat base for meeting future hunting needs. Wildlife management agencies cannot control all the critical habitat. Consequently, comprehensive planning could play an important role in habitat preservation. To be truly effective, habitat preservation must be accorded enough importance to justify investigation of alternate plans to satisfy general water needs. This could result in higher project costs and involve special damsite selection, or even diking rather than impounding for flood control. Multiple purpose planning should first employ zoning and green belt concepts to prevent intensive development which might destroy key habitat.

Habitat preservation for deer and elk is needed most on winter range which is usually the limiting factor for these species.

Adequate winter range is necessary for perpetuation of elk and deer. (Idaho Fish and Game Department)

This critical habitat is at lower elevations in the flood plains or canyon bottoms where relatively small portions of entire ranges may determine survival of big game. Pronghorn antelope have specific summer and winter ranges plus vital fawning or kidding areas that should be protected from conflicting uses. Preservation of wilderness type habitat is vital to retaining present numbers of mountain goat, mountain lion, bighorn sheep, moose, and grizzly bear.

Wildlife management agencies cannot significantly control crop production, land clearing, and other activities that threaten upland game. Consequently, major efforts should be made to encourage landowners to preserve and enhance habitat, especially critical habitat such as pigeon springs and nesting areas.

Virtually all waters serve waterfowl in some capacity. It is very important that key areas be protected from drainage and landfill. Some species, such as mallard and pintail, are grain feeders; therefore, cereal grain production, which is an integral part of winter carrying capacity, should be maintained to retain migration and wintering patterns that provide present hunting conditions. Water resource development will be instrumental in preserving waterfowl habitat if prime water habitat is obtained as a project purpose. Projects involving channel straightening should allow oxbows to retain water and natural vegetation. Riprapping, dikes, and concrete channels destroy waterfowl habitat.

Habitat Improvement

Although most big game biologists do not visualize extensive big game production through habitat improvements, the search for new techniques in this field of wildlife management is a continuing process. The major need for habitat improvement for deer and elk occurs on winter ranges where the quantity and/or quality of food plants has been reduced. Opportunities for upgrading winter ranges are discussed in the following measures:

(1) Ecosystem Manipulations. Prescribed experimental burns have proved relatively successful in some subregions. Under certain meteorological conditions and with specific types of incinerators, new plant growth (the best browse) can be stimulated by fire without destroying the entire plant or inherent soil qualities. Costs for this practice range from $0.50 to $30.00 per acre depending on such factors as the time of year, amount of preparation needed, location, and number of personnel required to control the fire.

Other experimental practices in this category include use of selective herbicides, scarification, and creation of permanent openings.

(2) Timber Management for Big Game. If timber production and allied wood products industries are oriented toward utilization of rapid growth timber species in immature forms, critical areas could be logged at much closer intervals. Natural plant succession immediately following logging operations generally produces excellent browse. Opening of dense timber stands by thinning encourages additional browse production of benefit to big game.

(3) Browse "Farming." Horticulture of native browse species for big game feed is in its infancy and has received very little attention. Opportunities to enhance browse production through plant genetics, cultivation, irrigation, and fertilization, have seldom been used in key big game range management. These processes have generally been considered too expensive and the lands that lend themselves to these practices have been dominated by competitive uses.

Seeding and planting woody browse species currently costs about $0.20 per plant (roughly $150 per acre), but more definitive cost estimates must be made on a project basis and will require more detailed studies.

(4) Zoning for Big Game. Many key and critical winter ranges have been lost to developments that could have been situated elsewhere. Urban sprawl (especially residential), construction of campgrounds, and many other developments have occurred on game ranges. Most of these structures could have been placed at higher elevations away from bottomlands without significantly reducing their value. Adequate zoning could insure that existing ranges are afforded protection from such developments. Properly conceived zoning plans would allow reclaiming historical wildlife ranges, if, and when, existing land use patterns prove uneconomical. For example, abandoned orchards where deer have been systematically excluded, could revert to winter range.

(5) Control of Livestock Grazing. Range management is largely oriented toward production of domestic livestock--often at the expense of big game herds. As big game herds become more important to the subregion's economy (dollars generated by the user public), range managers must shift this emphasis. Where competition exists, livestock grazing should be adjusted to provide optimum game range conditions. Programs of rest rotation grazing should be considered or, if necessary, domestic grazing should be completely eliminated. Improvements for livestock on summer ranges could offset range losses occasioned by lost winter areas. Additional detailed

studies will be needed to show where such forage releases should be made and to develop estimates of big game equivalent to livestock value.

(6) Mechanical Devices. Numerous mechanical devices have been used with varying results to prevent game losses caused by encroachment on game ranges. Some devices can be extremely useful on critical winter range. Once animals are restricted by winter weather they often lose inherent fears and must be protected from decimating factors they would avoid under normal conditions.

Key area fencing can be extremely effective. Fences should be used to keep wintering big game herds off highways and railroads where mortalities are high. Because these transportation routes are generally kept free of snow, they are exceptionally attractive to wintering animals. Where crossings are necessary, culverts and overpasses constructed specifically for this purpose have been successful. Wherever possible, high speed transportation facilities should be routed away from areas densely populated with game animals. Clearings along highways and railroads further concentrate the animals and the increased speed of modern transportation multiplies mortality.

Fencing occasionally proves valuable in keeping big game off their own winter range during summer months. It is generally a necessity when attempting to exclude livestock from such areas. Such practices conserve critical food supplies until the winter "pinch" period. In addition, many animals die trying to cross open irrigation canals and manmade impoundments. Fencing is often necessary to eliminate these losses. The need for such measures may not always be apparent until after a water development project has been completed.

Estimated capital costs for a 7.5-foot-high deer- and elk-proof fence generally range from about $1,500 to $2,500 per mile with annual maintenance of $15-20 per mile. Undoubtedly new needs for fencing will be discovered making additional fencing desirable. To determine exactly where and when such fencing will be needed and justified will require more detailed studies.

"Dutch Mirrors," headlight reflecting devices, have also proved moderately successful in reducing highway mortality in some locations. They are strategically installed along highway curves to reflect light ahead of traffic allowing the animals to move before being blinded by oncoming cars.

Harassment is now recognized as being a serious factor that limits wildlife use of many ranges. Highly-developed road systems in important wildlife ranges contribute to reduced carrying capacities although other necessary habitat elements are available. Road closures designed to re-establish isolated habitat for unmolested use by wildlife would prove beneficial, as would revegetation of the abandoned roadbeds. Direct and indirect (noise) harassment by snowmobiles on winter habitats of wildlife is becoming serious.

Habitat deficiencies of upland game are extremely varied. Improvement involves providing one or more of the following essentials--food, cover, water, or space--to increase carrying capacity.

Providing more food is usually accomplished by establishing grain or other plants in deficient areas.

Depending upon local situations, improved cover may be needed for protection from weather or enemies, or for resting and nesting. Increasing the amount of cover commonly requires planting dense growing plants or, in some cases, merely allowing natural plant succession to continue.

Water shortages are common in arid areas. Improvement may occur from spring or stock pond development, but a measure specifically for upland game involves "guzzler" construction. This device consists of an apron to collect runoff and a water container. Access is restricted to birds and small mammals. Estimated individual cost of guzzlers varies from $125 to $1,200.

There are other opportunities to enhance upland game and waterfowl habitat through land treatment; measures undertaken for one group will often benefit others. When arable lands are initially irrigated, many "pockets" of natural cover persist. As soon as it becomes feasible, farmers cultivate these cover areas to bring them into production. Such "clean farming" ultimately eliminates most upland game populations. Consequently, although upland game habitat (at least for pheasant) is generally a by-product of irrigation, these by-products are not necessarily perpetual.

To obtain lasting upland game benefits from an irrigation project, certain features must be incorporated in project plans. Significant acreages of "natural" cover and "edge" must be retained or created. Suggestions to accomplish this goal are:

(1) Selected "plots (10-40 acres) of arable lands should be set aside preferably in public ownership, to produce or retain native cover types. Approximately five percent of land per section (640 acres) should prove

adequate. It can be assumed that development, operation, and maintenance costs would be comparable to decentralized farming in contiguous lands.

(2) Water subscribers should be required to leave "belts" of native cover along selected project waterways, roadways, and other suitable areas. Major canals, drains, or wasteways would require approximately 400-foot wide "belts" on both sides of the waterway centerline. Costs of such measures should entail only a slight reduction in crop project benefits and these would largely be offset by the "game bird crop."

Having plots managed primarily for wildlife, while at the same time insuring that some cover vegetation is retained along waterways throughout the project would, in combination, produce optimum upland game populations.

In addition, public access to game plots and areas along waterways would be required to realize hunter-day benefits. These measures could be made a part of each water subscriber's contract whenever public funds are used to finance irrigation development or where public acreages are an integral part of project lands.

The proposed upland game habitat manipulation would also benefit waterfowl. Vegetative cover throughout the year is not as important to migratory birds as it is to upland game, but it is essential during nesting season. However, nesting cover is required in early spring and therefore must be grown during the previous growing season. Creation of habitat "plots" and/or "belts" would partially satisfy this need for nesting cover. Measures that should be undertaken specifically for waterfowl are under the following three headings: Food, Water, and Cover.

(1) Food. Ducks are generally classified as "dabblers" (predominantly grain feeders) or "divers" (feed primarily on aquatic plants and invertebrates). Increasing food for dabblers generally requires farming grains such as corn, barley, and wheat. Such crops can also be manipulated to attract birds for depredation control. For example, corn or burned barley are irresistible to ducks. Standing grain will remain available during winter months east of the Cascade Range after waste grain from adjacent harvested agricultural lands has been covered by snow. Also, if waterfowl management agencies, through agency-farmer relations, could influence time and method of harvest on private holdings, waste grains could be made available to waterfowl, and depredation problems could be reduced. Also, this would increase critical

carrying capacities for wintering waterfowl, and at the same time create more hunter-day use.

Again with adjustment for decentralized farming, cost associated with producing waterfowl food crops will be comparable to overhead costs on adjacent agricultural lands. These operating costs will be partially offset if the lands selected are strategically located to reduce depredation.

Food supplies for diving ducks are generally limited to natural aquatic plant and animal life. Lake, reservoir, pond, and waterway edges are critical because this organic matter is produced primarily in shoal areas. Consequently, stabilized water levels are important in maintaining diving duck populations. Cost of stabilizing water levels must be equated in reduced benefits resulting from changes in project operation and minimum pools.

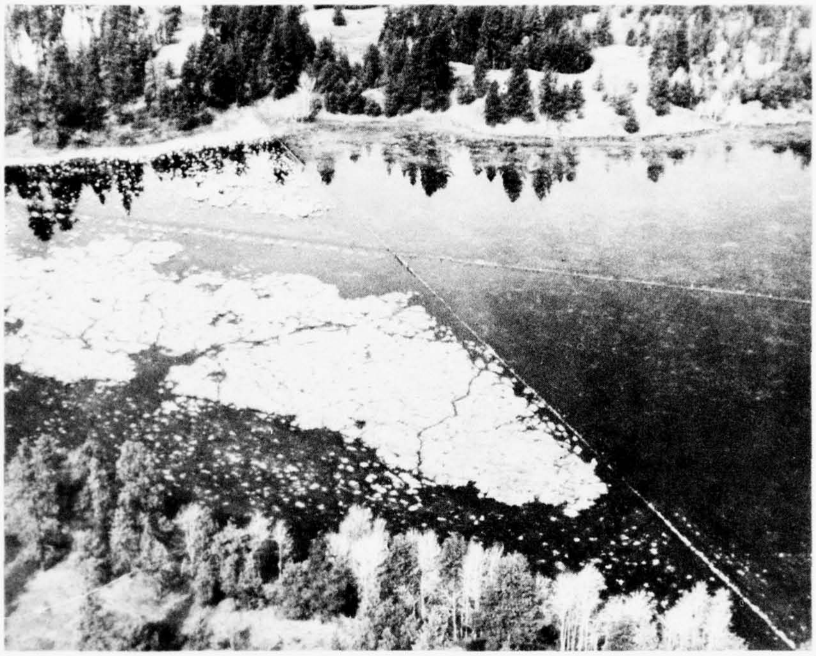
A few species are grazers; therefore, habitat development should include provisions for pasture. Widgeon are notorious grazing ducks although they are classified as "dabblers." Most of the year geese subsist on substantially the same diet as dabbling ducks found in their immediate vicinity. However, adult geese consume quantities of tender new grass shoots. In addition, "gosling pastures" or grazing sites located adjacent to suitable nesting habitat for newly-hatched geese are considered essential to successful goose production.

(2) Water. Water, as it pertains to waterfowl food production, has been previously discussed; as it pertains to large bodies of water for resting and protection, is treated under the discussion of Cover.

An additional consideration of importance is that undesirable fish often directly compete with waterfowl for aquatic plants and associated food organisms. Where such competition exists, it can be effectively controlled by eliminating these undesirable fish. Cost of lake and pond rehabilitation ranges from $1-2 per acre foot, plus labor.

(3) Cover. Large open water bodies provide adult waterfowl with protection from natural predators and hunters. However, during the nesting season, waterfowl seek small water bodies where breeding territories are established. Maximum reproduction depends upon the supply of these breeding areas. Water level fluctuations become critical during the nesting season. Receding water can make otherwise

well-concealed nests available to natural predators. Conversely, rising water levels often flood nests. In both cases, the nests are destroyed and production is lost.



Refuges provide food, water, and cover indispensable to nesting waterfowl. (Bureau of Sport Fisheries and Wildlife)

Native vegetation generally furnishes adequate cover for nesting waterfowl, and artificial plantings can be made where native cover is sparse or lacking. In the absence of opportunities to develop natural nesting cover, artificial nesting devices can be used. Nesting boxes, tubs, platforms, and islands have proved successful for certain species where food is available. These structures offer one of the few opportunities available to offset nesting habitat losses. Cost can range from $25 to several thousand dollars each depending on type, location, and other features of such structures.

More detailed information regarding waterfowl food, water, and cover requirements is available, but none of this knowledge can be uniformly applied to all water development projects. Detailed studies of individual projects will be necessary to determine measures to serve specific needs.

Although measures recommended to be undertaken for upland game, waterfowl, and big game will generally serve furbearers and "other wildlife" populations, environmental alterations should be recommended where needs are identified specifically for these groups. The impact of hydroelectric developments on beaver and their habitat has been drastic. The example of the plight of this species points to the need for specific studies and new management approaches to resolve this and similar problems.

A summary of wildlife habitat improvement means proposed by Federal and non-Federal agencies is shown in table 12.

Greater Harvest

In the future, increases in hunting will depend partially upon harvest of a higher percentage of game populations. This will occur because of greater numbers of hunters, but will also require specific management practices such as special or controlled hunts, and improving access for hunting on presently restricted areas.

Cooperation between land owners and hunters is essential for the proper management of all game species. (Iduho Fish & Game Dept.)

Table 12 - Wildlife Habitat Improvement Means, Columbia-North Pacific Region

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Seeding and planting	acre	74,125	5,262.5	92,285	6,474.5	91,970	6,444.0
Forage release & prescribed burning	acre	116,720	616.5	191,350	985.1	186,330	920.8
Key area fencing	mile	310	331.0	430	451.0	350	363.0
Permanent openings	acre	13,700	1,548.0	23,600	2,668.0	21,890	2,497.0
Wildlife food crops	acre	198,620	3,122.3	155,975	1,960.6	260,625	4,409.0
Guzzlers	each	190	190.0	250	250.0	180	180.0
Shallow impoundments and marsh improvements	acre	37,410	2,114.3	20,505	2,404.8	14,240	1,288.0
Develop potholes	each	130	36.0	170	39.0	140	33.0
Develop nesting facilities	each	1,240	63.0	1,572	78.0	1,310	66.0
Totals			13,283.6		15,311.0		16,200.8

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement1/	acre	2,016,430	13,969	3,246,300	37,483	3,411,500	27,867
Land acquisition2/	acre	859,000	79,874	487,000	45,636	652,000	62,043
Fencing3/	mile	2,244	2,152	1,536	1,916	766	1,197
Watering developments4/	each	2,053	1,084	1,307	496	1,068	241
Totals			97,079		85,531		91,348

1/ Includes cover plots, food patches, fencing, marsh development, potholes, and nest structures.
2/ By fee purchase and easement rights.
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land.
4/ Consists primarily of guzzler installations and spring development (including fencing) by agreement on private land.

Many factors, including animal numbers and public opinion, affect the establishment of special hunts, so it is difficult to outline future seasons or the amount of hunting that could be provided by these means. Improved access may be obtained through better public relations, hunting leases, or on lands acquired for habitat preservation.

Comprehensive water resource planning might offer some opportunity to improve access through issuance of rights-of-way over project lands, or acquisition or leasing of extra lands specifically to eliminate private ownership problems. This would require analysis on an individual project basis.

Augmentation of Supply

Augmentation of supply will become increasingly important in future years as the quantity and quality of wildlife habitat are further reduced. Satisfying future hunting needs will require a number of programs to increase the amount of wildlife on accessible hunting areas. Artificial propagation of upland game, especially pheasant, will become more extensive. Exotic species may be introduced if researchers find species adaptable to local conditions and compatible with other wildlife or domestic animals. Native species should be transplanted if local problems can be solved.

Artificial feeding of upland game and waterfowl during severe winters (about 5-year frequencies) may become a useful tool. Without adequate brood stock survival, natural production for the year following the severe winter may be greatly diminished.

Under certain conditions, feeding big game herds is also a useful management technique. Where low-lying big game winter ranges are limited, feeding may be desirable.

NEEDED RESEARCH, LEGISLATION, AND POLICY CHANGES

Research

Fish and wildlife biology is a broad and relatively new field involving complex interrelationships between organisms and their environment. Many facets of these interrelationships are not known, or are imperfectly understood. A large amount of research is urgently needed as a basis for scientific management of these resources and to assist in coordinated resource planning of the total environment. If future demands on the resources are to be met, a coordinated, well funded research program involving all the States of the Columbia-North Pacific Region, as well as the Federal

Government, must be instituted and the results applied to the conservation and enhancement of fish and wildlife.

The following list is a sampling of the most pressing research needs known at this time. The numbering of items is not based on priority. Some of these are projects underway; others represent known gaps in data needed for adequate management of the resources. Still others, not listed here, may develop as the impact of man on his environment becomes more fully realized.

Fish

(1) Determine the reasons for losses of upstream migrating adult salmonids between Columbia River dams.

(2) Determine the causes of reduction in numbers of certain major runs of salmon and steelhead.

(3) Continue research on the causes of mortality to downstream migrant salmonids in regional rivers.

(4) Determine, more specifically, the effects of withdrawal of reservoir surface water and power peaking on downstream migrant passage through reservoirs.

(5) Determine the effect of transporting downstream migrants around reservoirs, dams, and other problem areas.

(6) Study the incidence and effects of fish disease and parasites associated with reservoirs and lakes.

(7) Define the relationships between specific water quality factors (including effects of thermal discharge) and behavior of migrating adult salmonids and juvenile salmonids residing in reservoirs.

(8) Determine the best method to rehabilitate physical portions of streams to increase habitat. Provide the basis for standard structures that can be used to improve streams and rivers destroyed or damaged by roads, highways, channeling, and floods.

(9) Further study of the relationship of logging to fish production.

(10) Determine the effects of various types of pollution on adult and juvenile salmonid migrations. Optimum water quality criteria need to be determined for each species.

(11) Determine relationship of seasonal stream discharge variation to fish production.

(12) Study factors influencing abundance of shad in coastal streams and the Columbia River. Determine a method of selectively harvesting this species.

(13) Determine the environmental correlates of inter-gravel conditions with salmonid embryo and alevin development and survival.

(14) Investigate the interrelationships of estuaries to provide a basis for monitoring environmental changes and provide the framework for effectively managing estuarine-dependent resources. Studies should determine the distribution, use, and value of these resources; identify factors affecting their abundance; determine the extent that pollution and other problems affect these resources; determine present industrial use of estuaries; and suggest potential for industrial development compatible with preservation, conservation, or enhancement of estuarine environments.

(15) Determine the importance of the Columbia River estuary and other estuaries to juvenile salmonid survival.

(16) Study flows and fish production in artificially controlled stream channels.

(17) Determine suitable flows for fish during critical seasons by conducting cross sectional surveys of streams.

(18) Develop methods to predict annual anadromous fish runs in the Columbia River and other regional waters.

(19) Determine population, size, and potential harvest of Columbia River steelhead.

(20) Develop equipment for locating, identifying, and tracking movements of selected anadromous fish species, primarily in large streams and reservoirs. Locate and isolate races destined for individual river systems.

(21) Devise equipment to enumerate fish runs independent of ladders, weirs, tunnels, or other structures.

(22) Develop nonselective downstream migrant sampling gear for use in large rivers.

(23) Improve electroshocking equipment to extend its effective range.

(24) Refine the use of ice and trash sluiceways for safely passing downstream migrants over dams.

(25) Determine methods of safely passing upstream and downstream migrants at major dams, and evaluate passage facilities at newly constructed dams to develop optimum operation schedules.

(26) Determine potential of reservoirs for rearing various salmonids.

(27) Develop methods for identifying the most productive areas in reservoirs and where concentrations of fish can be found so that fish can be more easily harvested and fisherman use of the reservoirs encouraged.

(28) Conduct research for development of management practices to obtain optimum production of juvenile salmonids at existing and proposed impoundments.

(29) Develop better methods of lake aeration.

(30) Determine means to prevent nitrogen and other supersaturated gases in rivers downstream from hydro projects.

(31) Develop specific toxicants to kill undesirable fish without harm to preferred species.

(32) Develop lake and stream fertilization techniques.

(33) Develop an effective barrier to prevent upstream and downstream passage of undesirable fish or game fish.

(34) Determine means of increasing production and growth of white sturgeon and maintaining a larger population of harvestable fish.

(35) Identify salmonid species which might be successfully introduced into new areas. Develop practical techniques for effecting transplants.

(36) Study or investigate use of thermal discharge for growing warmwater fish as a food supply.

(37) Explore the feasibility of creating artificial streams for rearing and for returning anadromous fish to specific areas.

(38) Continue research on fish hatchery techniques and diseases, release timing and size, food, and re-use of available water.

(39) Develop a standard for comparing the viability of hatchery fish.

(40) Improve hatchery stocks of salmon and steelhead by selective breeding.

(41) Develop a marking device for crabs that will be carried through several molts so that information on growth and movement can be obtained.

(42) Identify causes of cyclic fluctuation in crab numbers.

(43) Develop techniques for raising seed oysters in hatcheries.

(44) Develop methods of artificially propagating abalone.

(45) Study feasibility of artificially propagating clams and introducing stocks into barren areas. Develop techniques to create new clam habitat through use of dredge spoils.

(46) Develop marking techniques for studying migrations of pink shrimp.

(47) Study the effects of oceanic conditions on bottomfish eggs and larvae, and other factors necessary to predict and influence the relative abundance for harvest.

Wildlife

(1) Determine the response of big game browse plants to sprinkler irrigation; determine costs.

(2) Determine means to increase productivity of winter range for big game and key habitat for other species.

(3) Develop methods to increase waterfowl nesting capacity of wetlands.

(4) Determine what combination of factors (including vegetation, elevation, exposure) encourages greatest nesting utilization of a given area by waterfowl and upland game.

(5) Determine means for estimating and evaluating nonhunting use of wildlife.

(6) Investigate means and techniques for satisfying future demand for wildlife through artificial production or species introduction.

(7) Determine benefits and adverse effects of artificially feeding wildlife as a management tool to fulfill anticipated demand. Develop palatable and nutritious food concentrates and feeding techniques to expand carrying capacity of wildlife winter range.

(8) Continue research on the effects of pesticides and herbicides on wildlife.

(9) Determine factors that cause fluctuations in grouse populations.

(10) Develop means to selectively control pest animal populations.

(11) Develop repellant to reduce or eliminate beaver damage to orchards, ornamental trees or shrubs, and in other situations.

(12) Develop an effective means to prevent crop depredation by deer, elk, and other wildlife.

Legislation

Existing legislation designed to involve fish and wildlife programs on an equal basis with other purposes in water development plans has proved inadequate, or provisions of these laws are used for other than their intended purpose. Legislation to further fish and wildlife conservation and enhancement is needed; these resources are becoming more important to a large segment of the public in their outdoor recreation activities. Fishing and hunting and other wildlife related recreation are regarded as traditional rights of Americans. These rights should be protected and perpetuated for their benefits to society and wise use of the fish and wildlife resource.

The following actions are considered essential in areas where adequate rules, regulations, and statutes for the conservation and enhancement of fish and wildlife are not already in force. The numbering of items is not based on priority.

(1) Enact statutes and methods of enforcement to insure stream channel and lake shore preservation and to control surface mining.

(2) Secure legal recognition of fish and wildlife conservation and propagation as a beneficial use of all State waters.

(3) Enact legislation to establish legal optimum water levels and operational standards in manmade water bodies or controlled natural lakes and to establish legal minimum streamflows at the outlets to such water bodies.

(4) Provide for protection of scenic and wild river values through State legislation to supplement Federal legislation.

(5) Enact State legislation to allow revenue raising measures to be undertaken for full participation in resource enhancement opportunities at Federal water development projects.

(6) Amend the Federal Water Project Recreation Act to require that the separable costs of features to enhance anadromous fish, migratory waterfowl, and estuarine resources and the annual operation and maintenance costs therefor shall be nonreimbursable Federal costs.

(7) Encourage rapid adoption of open space, green belt, and fish and wildlife zoning legislation.

(8) Legislatively adopt uniform guidelines for estuarine preservation, development, and use planning.

(9) Continue to encourage Federal legislation which would recognize the States' authority to manage resident fish and wildlife similar to S. 1232, which has passed the United States Senate.

(10) Enact State legislation similar to the Federal Fish and Wildlife Coordination Act to provide State conservation agencies with an effective tool in the conservation and enhancement of fish and wildlife resources at State water development projects.

(11) Encourage Federal legislation which would enhance fish and wildlife as a result of the Public Land Law Review Commission report[1/] to include retention of Federal lands in public ownership.

(12) Enact more specific legislation to prohibit the use of "benefit-cost" types of analyses to justify loss prevention measures in monetary terms.

(13) Encourage legislation relating to total environment planning.

(14) Enact legislation providing for broader based financial support for State fish and game programs, including study and enhancement of non-hunting and non-fishing use.

1/ Submitted to the President June 20, 1970, under provisions of P.L. 88-606.

Policy Changes

Policies of water development project sponsors generally do not include adequate consideration for fish and wildlife. Fish and wildlife mitigation measures and significant intentional enhancement measures often have been inadequate or nonexistent. To insure future hunting, fishing, and esthetic enjoyment, fish and wildlife must be given the consideration afforded other project affected interests.

Following is a list of needed changes involving policies governing all water and related land. They are not presented according to priority.

(1) Fish and wildlife should be included as an authorized project purpose. This essential requirement should apply equally to first authorizations or when supplemental project features require reauthorization.

(2) Water development projects should demonstrate environmental feasibility as well as economic feasibility. At times, concessions should be made to maintain important national environmental assets.

(3) Fish and wildlife habitat retention should be stressed on State and Federal water development projects and on other Federal project lands when at all compatible. This would reduce losses to food, cover, and living areas essential to these resources.

(4) A share of project lands in newly-developed agricultural areas should be retained in public ownership; these lands should be dedicated to wildlife habitat. Public use for hunting or other recreational activities on all project lands should be assured.

(5) Adjudication of water rights on streams should be stressed to insure preservation of aquatic habitat. This is essential because potential exercise of seldom used rights and over-appropriation constitute threats to downstream areas and users.

(6) Replacement in kind of publicly-owned fish and wildlife resources and habitat similar to the current policy of replacing publicly and privately owned utilities, townsites, and other features or structures should be required.

(7) Mitigation measures for project-caused fish and wildlife losses should be undertaken wherever available potential exists. This may be many miles from the project site.

(8) Public lands--either State or Federal--leased for specific uses should be open to fishing and hunting where practicable and at no additional costs to the public. This would help satisfy a portion of the overall future demand.

(9) The unit-day values assigned to man-days of fishing and hunting in Supplement No. 1, Senate Document 97, should be revised and updated. This would equate values used to denote the economic importance of fish and wildlife with those assigned to other uses of water and related land resources. Values of some kind must also be assigned esthetic qualities associated with fish, wildlife, and their habitats if the total environment is to be equitably considered.

LOCATION MAP

SUBREGION 1

SUBREGION 1

CLARK FORK - KOOTENAI - SPOKANE

GENERAL DESCRIPTION OF SUBREGION

Subregion 1, Clark Fork-Kootenai-Spokane, occupies the extreme northeast corner of the Columbia-North Pacific Region. It includes all of Montana west of the Continental Divide, the panhandle of Idaho, and approximately two counties in northeastern Washington. As its name implies, the subregion contains the Clark Fork and headwaters of the Spokane River as well as a portion of the Kootenai River within the United States. Glacier National Park and 10 national forests are either completely or partially in the subregion.

HISTORY OF FISH AND WILDLIFE

Fish and game management in the subregion probably followed a pattern similar to the one it followed in Montana. In 1865 the first Montana Territorial Legislature passed a law which stated, "A rod or pole, line and hook shall be the only lawful way trout can be caught in any stream of the Territory." Following this beginning, fisheries management consisted of a growing list of limitations on anglers and a rapidly expanding program of planting fish by both State and Federal hatcheries. Paralleling these events was the gradual and continual deterioration of the fish resource. In 1963, Montana passed temporary legislation that protected trout streams from physical alteration during highway construction; this law was to expire in two years. The 1965 Legislature subsequently passed an improved and permanent bill with only a single dissenting vote. For the first time habitat was legally protected and recognized as having a relationship to fish populations. This milestone came 100 years after the first law regulating means of catching fish. While this legislation does not stem the tide of trout stream habitat destruction, it is a beginning. It is interesting to speculate on the condition of this stream fishing resource, had the order of passage of these laws been reversed.

Habitat as a key was recognized in 1936 when winter deer ranges were leased in western Montana. However, the protectionist philosophy was dominant and refuges and buck laws characterized game management until inauguration of the Pittman-Robertson Act when they were gradually phased out of management. Current State and Federal programs now emphasize balancing big game herds with available winter forage and allowing hunters to crop as much of the annual surplus of all game species as possible.

PRESENT STATUS

The groups of fish and wildlife comprise resident fish, big game, upland game, fur animals, waterfowl, and other wildlife. In varying degrees, they inhabit the entire subregion and are extensively used by residents and visitors. The intensifying demands being made on the natural resources are having a profound effect on animal populations as their environment is altered to meet human wants. Figure 5 locates and identifies major State and Federal fish and wildlife lands and facilities. These installations and areas are of special importance to one or more kinds of fish and wildlife.

Resident Fish

Sport fish of importance that now occupy the remaining habitat are cutthroat trout, rainbow trout, brook trout, Dolly Varden, lake trout, brown trout, kokanee, Arctic grayling, mountain whitefish, lake whitefish, and white sturgeon. There are also populations of warmwater, or spiny-rayed fish, that are important for a few local fisheries, but are presently considered detrimental to the habitat.

Specific data on game fish distribution are fragmentary and complicated, but general statements can be made concerning the types of habitat the various species now occupy.

The cutthroat trout once was widely distributed. Now it is restricted to remote headwater areas, where natural barriers and remote back country have protected its habitat from development, to lakes where competition and predators have been removed, and to some big lakes and their tributaries where its habitat has been only partially destroyed. A survey of cutthroat trout distribution in Montana showed that 75 percent of cutthroat streams are inaccessible by road. The Montana westslope cutthroat is considered an endangered species.

Rainbow trout generally occupy the larger streams and rivers. It is not native to these drainages and considerable numbers are planted annually in both lakes and streams. Kamloops, a variety of rainbow trout, is also found within the subregion, primarily in Lake Pend Oreille, Idaho.

The brook trout, while not native to the area, is widely distributed, except for the South Fork Flathead River and its tributaries.

The Dolly Varden is a resident of the rivers and large lakes and seasonally ascends many smaller tributaries to spawn. Unlike

the cutthroat, it has been able to compete favorably with the exotic fish and maintain a partial hold on what remains of its native habitat. Probably the best remaining habitat for the Dolly Varden is in the big lakes where adequate spawning tributaries are available.

The lake trout has established itself and reproduces in several deep, cold lakes where it has been introduced.

Another exotic fish is the brown trout. Generally, this fish now occupies the warmer streams, large rivers, and some reservoirs, sustaining itself through natural reproduction.

The mountain whitefish is widely distributed throughout the larger streams, rivers, and lakes. Lake whitefish have been introduced into some waters where populations have become established and now sustain themselves. Little is known about the extent of such populations or their habitat requirements in this area.

Kokanee were introduced in the early 1900's and extensive populations of this species exist in many lakes where adequate spawning habitat is available. They have been observed to successfully reproduce in tributary streams and in some cases on shoal areas in lakes. The kokanee not only provide significant sport and commercial angling but also provide forage for piscivorous fish like Dolly Varden, lake trout, and Kamloops.

Remnant populations of grayling inhabit a few lakes and streams. These populations are found only in areas where an isolated environment can be provided and maintained. These populations resulted from introductions from the eastern slope of the Rockies.

The largest fish found in the subregion is the white sturgeon. This fish has a very limited distribution, being confined to the Kootenai River.

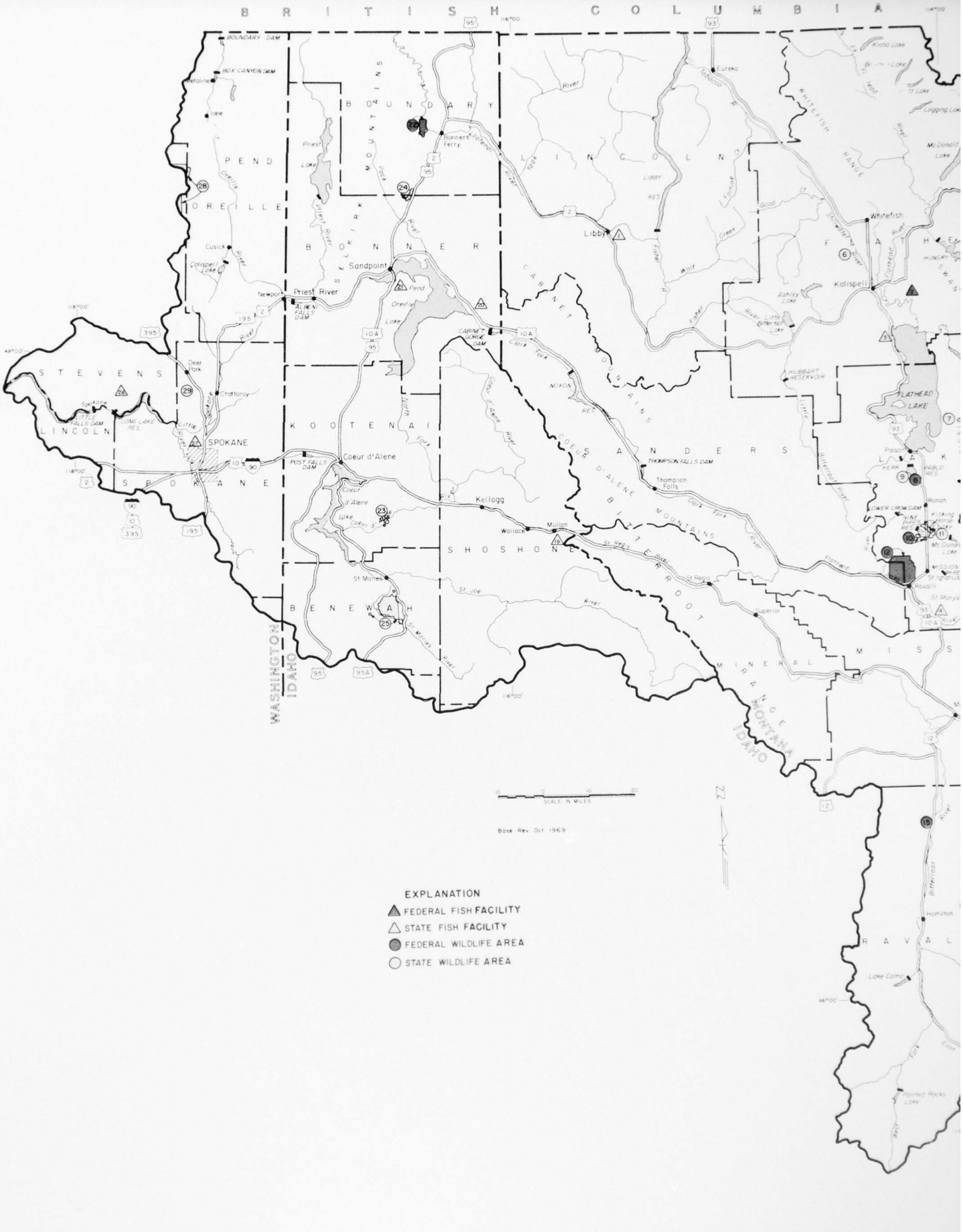
Habitat

From the standpoint of volume of fishing water, the subregion is generously endowed. There is no accurate figure on the miles of streams or the number and acreage of lakes available for development in the subregion as a whole. The State of Washington has 52 lakes in its portion of Subregion 1 with total surface area exceeding 14,900 acres. The panhandle of Idaho has 127 lakes with a total of over 147,000 surface acres. Western Montana has between 1,000 and 1,500 natural lakes according to the best estimates. Those Montana lakes that have been surveyed total about 180,000 surface acres; the actual total acreage of natural lakes, of course, would be higher.

FIGURE 5. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	Libby State Fish Hatchery		2,059
2	Creston National Fish Hatchery		60,000
3	Somers State Fish Hatchery		2,971
4	Arlee State Fish Hatchery		33,591
5	Anaconda State Fish Hatchery		53,637
6	Bowser Lake State Game Range	431	
7	Flathead Lake Goose Islands and Brood Areas	136	
8	Pablo National Wildlife Refuge	2,542	
9	Pablo State Game Management Area	387	
10	Ninepipe National Wildlife Refuge	2,022	
11	Ninepipe State Game Mgt. Area	2,755	
12	National Bison Range	18,540	
13	Blackfoot-Clearwater State Game Range	49,617	
14	Threemile State Game Range	2,316	
15	Ravalli National Wildlife Refuge	2,290	
16	Bitterroot State Game Range	2,442	
17	Warm Springs State Game Farm	15	
18	Warm Springs State Game Mgt. Area	3,135	
19	Mullan State Fish Hatchery		1,006
20	Clark Fork State Fish Hatchery		60,123
21	Sandpoint State Fish Hatchery		7,998
22	Kootenai National Wildlife Refuge	2,762	
23	Coeur d'Alene Wildlife Management Area	1,082	
24	Boundary County Wildlife Management Area	1,086	
25	St. Maries Game Range	12,192	
26	Ford State Fish Hatchery		93,045
27	Spokane State Fish Hatchery		80,506
28	Little Pend Oreille Wildlife-Recreation Area	1,788 1/	
29	Spokane State Game Farm	160	
30	Garrity Mountain State Game Range	1,280	

1/ Estimated portion of this big game range within the boundaries of Subregion 1 - the remainder is in Subregion 2.



BRITISH COLUMBIA
PEND OREILLE
BOUNDARY
LINCOLN
BONNER
STEVENS
SPOKANE
KOOTENAI
SANDERS
SHOSHONE
BENEWAH
MINERAL
WASHINGTON
IDAHO
MONTANA
IDAHO
SPOKANE
Sandpoint
Priest River
Newport
Coeur d'Alene
Kellogg
Wallace
Mullan
Libby
Whitefish
Kalispell
Thompson Falls
Bonners Ferry
St Maries
FLATHEAD LAKE
Hamilton
SCALE IN MILES
Base Rev Oct 1969
EXPLANATION
FEDERAL FISH FACILITY
STATE FISH FACILITY
FEDERAL WILDLIFE AREA
STATE WILDLIFE AREA

AD-A036 559 PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6
COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)
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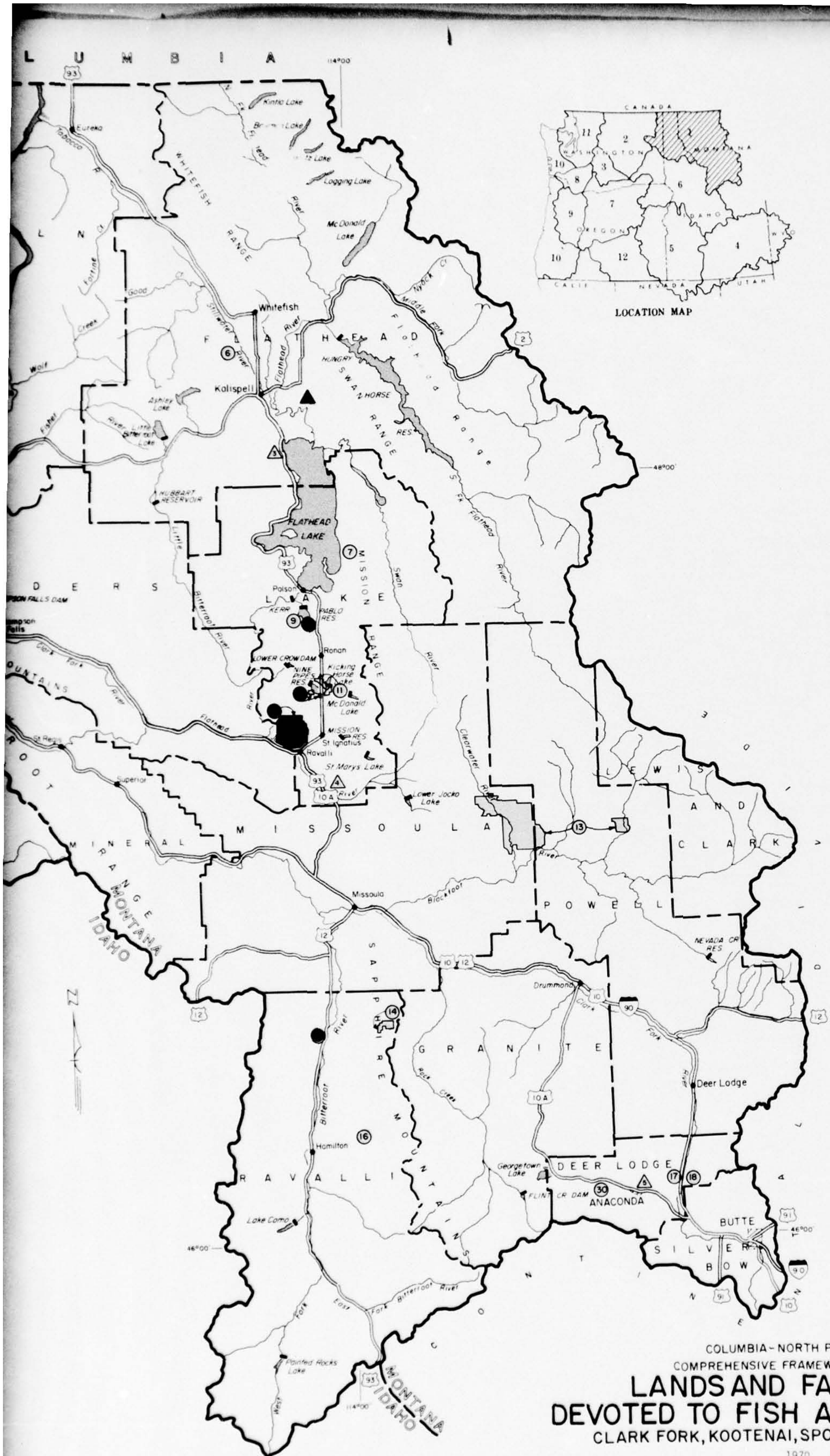


COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

CLARK FORK, KOOTENAI, SPOKANE SUBREGION I

1970

FIGURE 5

At any rate, the basic minimum of about 342,000 surface acres of standing water provides a substantial habitat for lake-dwelling fish.

The subregion has numerous reservoirs both large and small. Approximately 1,100 farm ponds have been constructed. Many mountain lakes and streams are used to irrigate mountain meadows and river valleys; the storage impoundments associated with these projects provide some fishing areas. The major mainstem impoundments furnish at best poor fisheries that can only be maintained at an expense far beyond the benefits obtained by anglers under present day values.

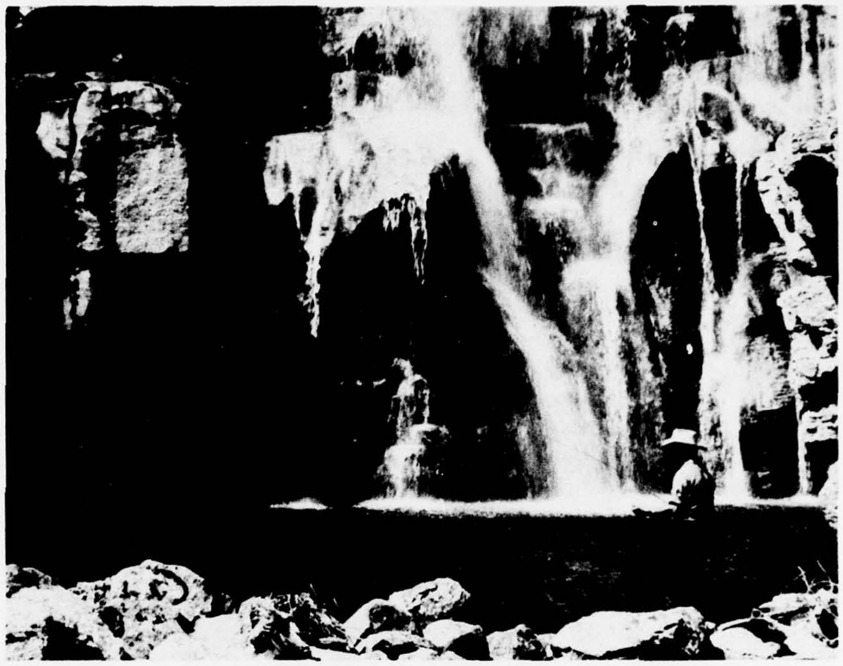
While the above picture of numbers and areas of lakes is an estimate, it is reasonably accurate when compared to data that could be provided on the subregion's streams.

Washington has about 580 miles of stream habitat in its portion of the subregion of which only 42 miles can be considered good trout streams. Northern Idaho possesses approximately 2,000 miles of relatively good stream habitat. In Montana and Idaho, trout streams have been classified and rated on the basis of availability, esthetics, use, and productivity. The location of classified streams is presented in figure 6. The stream classification, while not tailored for comprehensive planning, was included to illustrate that quality stream habitat is limited and in need of special consideration if stream fishing values are to be preserved on a significant scale.

Use

Sport fishing use amounted to about 1,510,000 man-days in 1965. A fisherman survey indicated that about 500,000 fisherman-days are expended in western Montana each year. This survey also indicated that most nonresidents coming to Montana to fish came to angle in the remaining trout streams and rivers. Some nonresidents came to fish in natural lakes, but significantly, the survey indicated that the reservoirs in western Montana did not attract them. Angler use on a specific body of water undoubtedly is higher in the more populated areas. For example, in the Washington portion, lakes and reservoirs are very heavily fished and support the major portion of the subregion's entire fishery. Table 13 shows the analysis of fishing by State.

In 1965 sport fishermen spent about $5,300,000 fishing for resident fish. However, monetary expenditures are only an indicator of the importance of this resource. The opportunity for high quality trout fishing amidst scenic surroundings is one of the outstanding attractions of the subregion, and these esthetic values are difficult to measure or express. Many of the fishing waters are of national as well as local importance.



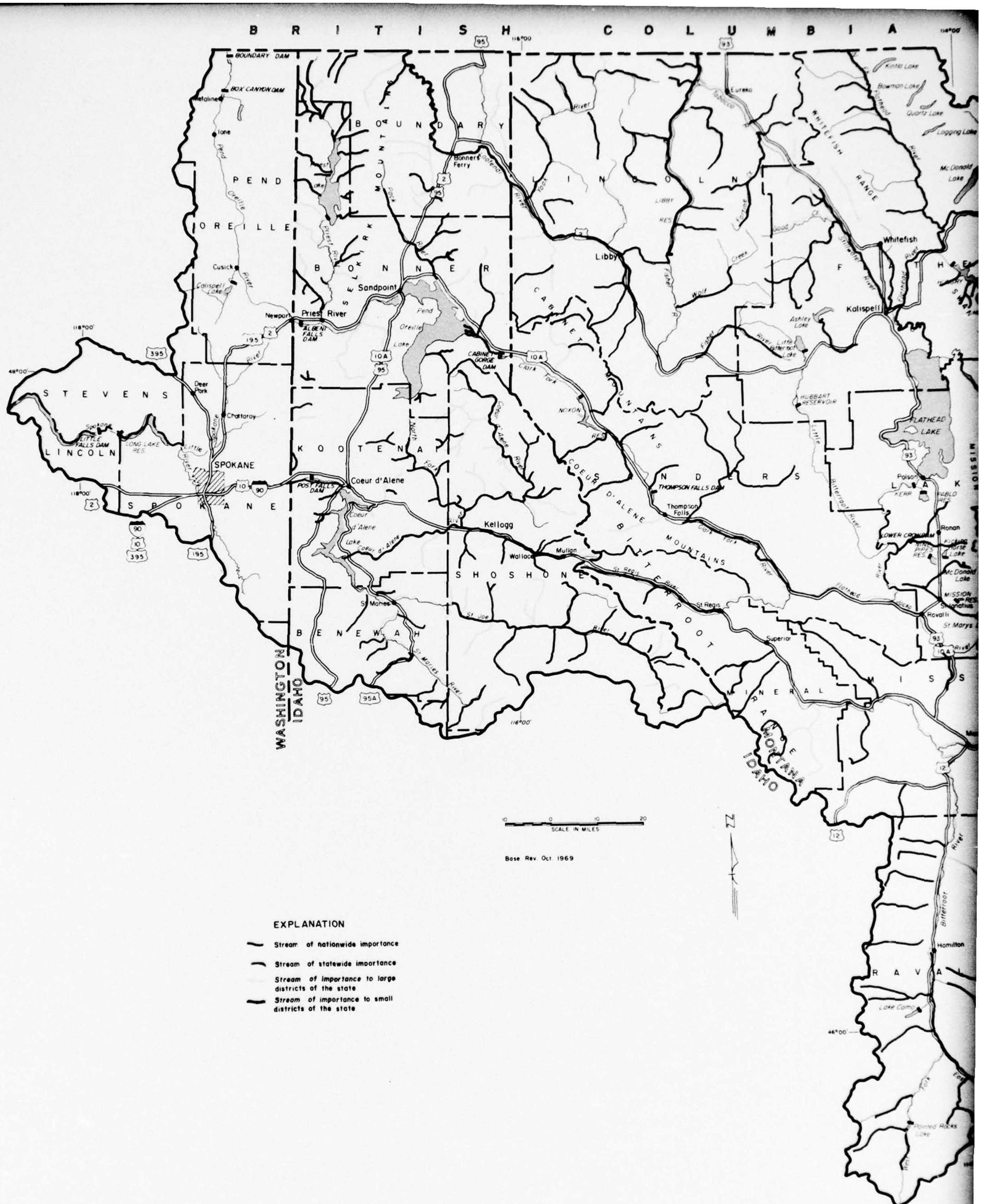
High quality trout fishing amidst scenic surroundings is one of the outstanding attractions of the subregion. (Montana Department of Fish and Game)

Table 13 - Estimated Sport Fishing Use of Resident Fish, Subregion 1, 1965 1/

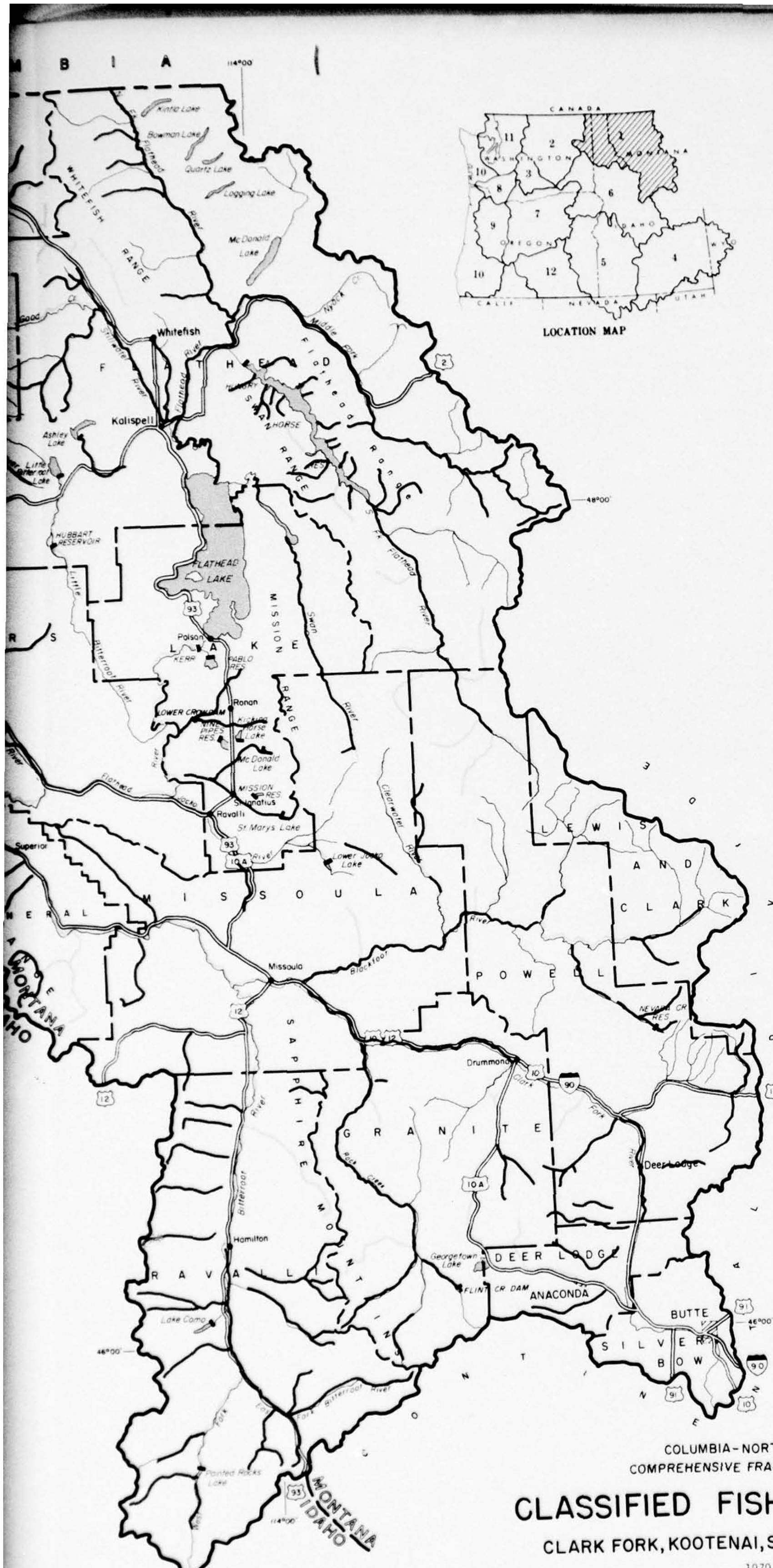
Angler-Days			
Idaho	Montana	Washington	Total
162,000	500,000	848,000	1,510,000

1/ Estimates based on data obtained from fish and game agencies of respective States.

The only commercial fishery of any consequence in the subregion is the kokanee fishery on Lake Pend Oreille. It has an average harvest of approximately 80,000 pounds a year sold to wholesalers for about $48,000 annually. Factors such as gas, bait, and equipment purchases by the anglers are unknown: consequently, the total economic import of this fishery cannot be readily calculated.


BRITISH COLUMBIA
BOUNDARY DAM
BOX CANYON DAM
Metaline
Ione
PEND OREILLE
BOUNDARY
BONNER
LINCOLN
Bonners Ferry
SELKIRK MOUNTAINS
Libby
Eureka
WHITEFISH RANGE
Whitefish
Kalispell
Cusick
Calispell Lake
Sandpoint
Newport
Priest River
ALBENI FALLS DAM
Pend Oreille Lake
CABINET GORGE DAM
CABINET MOUNTAINS
Ashley Lake
Little Bitterroot Lake
HUBBART RESERVOIR
FLATHEAD LAKE
STEVENS
Deer Park
Chattaroy
LITTLE FALLS DAM
LONG LAKE RES
LINCOLN
SPOKANE
KOOTENAI
Coeur d'Alene
POST FALLS DAM
Noxon
THOMPSON FALLS DAM
Thompson Falls
SANDERS
COEUR D'ALENE MOUNTAINS
Kellogg
Wallace
Mullan
Coeur d'Alene Lake
SHOSHONE
BITTERROOT
St Regis
Superior
St Maries
BENEWAH
MINERAL
Polson
Ronan
KERR DAM
MISSION RES
St Ignatius
Ravalli
St Marys Lake
McDonald Lake
WASHINGTON
IDAHO
MONTANA
IDAHO
Hamilton
RAVALLI
Lake Como
Painted Rocks Lake
SCALE IN MILES
Base Rev. Oct. 1969
EXPLANATION
Stream of nationwide importance
Stream of statewide importance
Stream of importance to large districts of the state
Stream of importance to small districts of the state

2



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

CLASSIFIED FISHING STREAMS

CLARK FORK, KOOTENAI, SPOKANE SUBREGION I

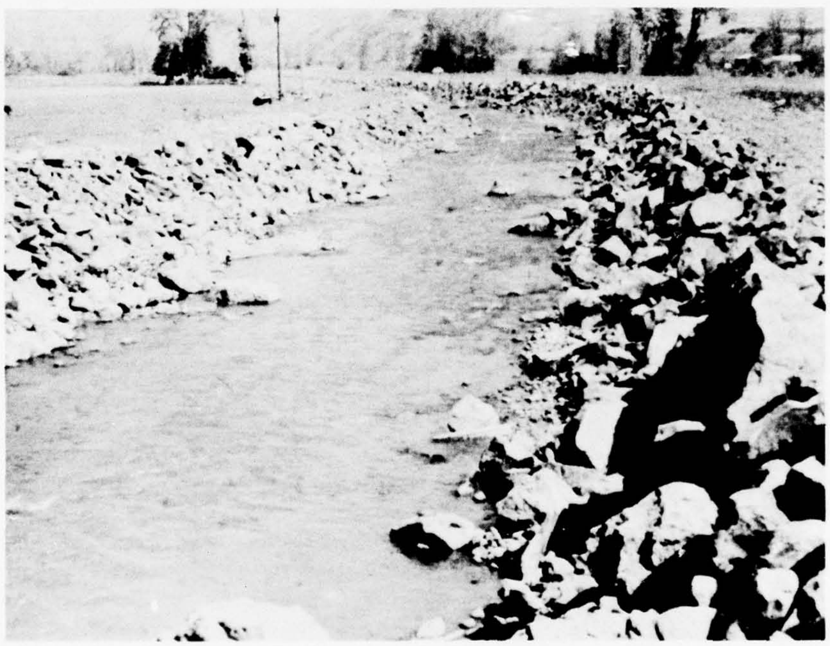
1970

FIGURE 6

Factors Affecting Resource

The stream habitat is steadily declining in quantity and in some cases continues to be of poor quality. This condition persists despite increasing emphasis on improving water quality standards and an increased awareness of pollution problems.

Perhaps the most serious problem is the continuing physical destruction of streams by channeling. This plus the obvious stream loss through creation of impoundments, while taking only a little at a time, now add up to the major portion of a resource. In eastern Washington, the Spokane and Pend Oreille Rivers have lost over half their length to reservoirs now teeming with rough fish. Another example is the St. Regis River in Montana where, in 37.1 miles of river, 25.4 miles have been adversely affected by 121 channel alterations. These were the result of highway and railroad construction.



Channeling eliminates stream meanders, reduces pool areas, increases gradient and water velocities, and removes streambank cover. (Idaho Fish and Game Department)

Pollution continues to claim its annual toll of streams. The most obvious cases of continuing mine pollution are the Coeur d'Alene River in Idaho and the upper Clark Fork in Montana. Together these two examples account for the complete elimination of fish from about

80 miles of stream and serious impairment of the ability to produce fish over many additional miles. Domestic pollution is becoming an increasingly serious problem as human populations grow and urbanize.

Silt, another form of pollution, is frequently ignored. While fish themselves can tolerate heavy concentrations of silt, its effects on the habitat are as damaging as any other pollutant.

The profusion of impoundments on many rivers has created temperature problems that frequently are detrimental to fish production.

Highly toxic and persistent pesticides continue to accumulate on the land and ultimately in the aquatic environment. Since some of these chemicals are rather stable and toxic to fish and fish food organisms, they pose a long-lasting threat to the fish resource.

Another factor affecting the remaining stream habitat is dewatering of streams, primarily by irrigation diversions. The consumption of a stream's total summer flow is a common occurrence. In addition to totally drying up many streams, considerable additional damage occurs from the partial dewatering of many more miles of stream.

The lentic habitat in the subregion is extensive, varied, and beset with a variety of problems. Lakes, reservoirs, and lakes with flow-control structures will be considered together as in many cases their problems are similar.

Basic to the development of many trout or salmon fisheries in standing water is an adequate system of tributary streams in which these fish can reproduce. Factors detrimental to stream-spawning species are the deteriorating quality of associated streams and the blocking of entire river systems with dams. Facilities such as artificial spawning channels and fish ladders have had little success with the fish species being managed in the subregion's waters. The kokanee is an important fish in the four largest lakes of the subregion, all of which have storage-control facilities on their outlets. Kokanee spawn either in tributary streams or on lake shoal areas. Lowering of water levels in winter can cause egg mortality and seriously impair kokanee reproduction.

Development of desirable cold-water fish populations in lakes is also impaired by the presence of competitive or predatory species such as rough fish or various warmwater species. In small lakes, periodic poisoning and stocking with small trout have provided good fisheries. This technique is used in the more intensively-managed waters in northeastern Washington.

As in streams, domestic pollution is becoming a widespread problem in lakes. In some cases, the shoreline of natural lakes is as densely populated with people as most suburban neighborhoods but without adequate waste treatment facilities.

The introduction of certain exotic species has created special problems. Every effort is being made to keep rainbow trout out of areas being managed for cutthroat trout, as genetically the rainbow is considered a particular threat to the native cutthroat. Rainbow trout that survive in this habitat do not provide as good a fishery as do the native cutthroat. For the most part, brook trout become very numerous and display a generally poor rate of growth. These populations are considered a detriment to the cutthroat populations where they occupy the same habitat. The brook trout is able to outcompete the cutthroat for available food and space in the habitat they share. However, the fishery it provides is considerably poorer than that provided by the cutthroat it replaces. The whitefish has been able to sustain itself in spite of competition from exotic fish now co-inhabiting its diminished stream habitat. Once abundant in big lakes as well as streams, whitefish numbers have been reduced in lake environments as a result of competition from kokanee.

Big Game

Big game animals include white-tailed deer, mule deer, elk, moose, black bear, grizzly bear, bighorn sheep, and mountain goat. Mountain caribou, pronghorn, and bison also occur but are not currently being hunted.

Habitat

Big game is distributed throughout the subregion. Mountain goat occupy remote high country while white-tailed deer dwell in brushy bottoms, at times near to man. The grizzly bear requires a relatively pristine environment.

Distribution of deer and elk, if plotted on a subregional map, would cover the entire area and give a misleading appraisal of the situation. The deer and elk herds are limited by the quality and quantity of range available to them during the critical winter months. In the far western section of the subregion where climatic conditions are not as severe, this problem is not as acute. These winter areas for deer and elk have been outlined in figure 7. They are approximations showing the general location of critical areas and should not be considered precise.

Suitable winter range occurs where it does for a variety of interrelated reasons. Some of these reasons are snow depth, slope, exposure, soil type, elevation, and moisture. The location of these critical areas is often adjacent to existing watercourses. Also,

the more mountainous the terrain the more restricted are the key winter areas. A fine example of this is the South Fork Flathead River upstream from Hungry Horse Dam. Here, elk that inhabit the vast Bob Marshall Wilderness are squeezed onto the bottoms and low side hills along the South Fork. Here, they must find sustenance or starve.

Use

Hunters spent about 400,000 man-days hunting big game in 1965. Table 14 shows an analysis of this use by States.

Table 14 - Estimated Hunting Use of Big Game, Subregion 1, 1965 1/

Hunter-Days			
Idaho	Montana	Washington	Total
100,000	250,000	50,000	400,000

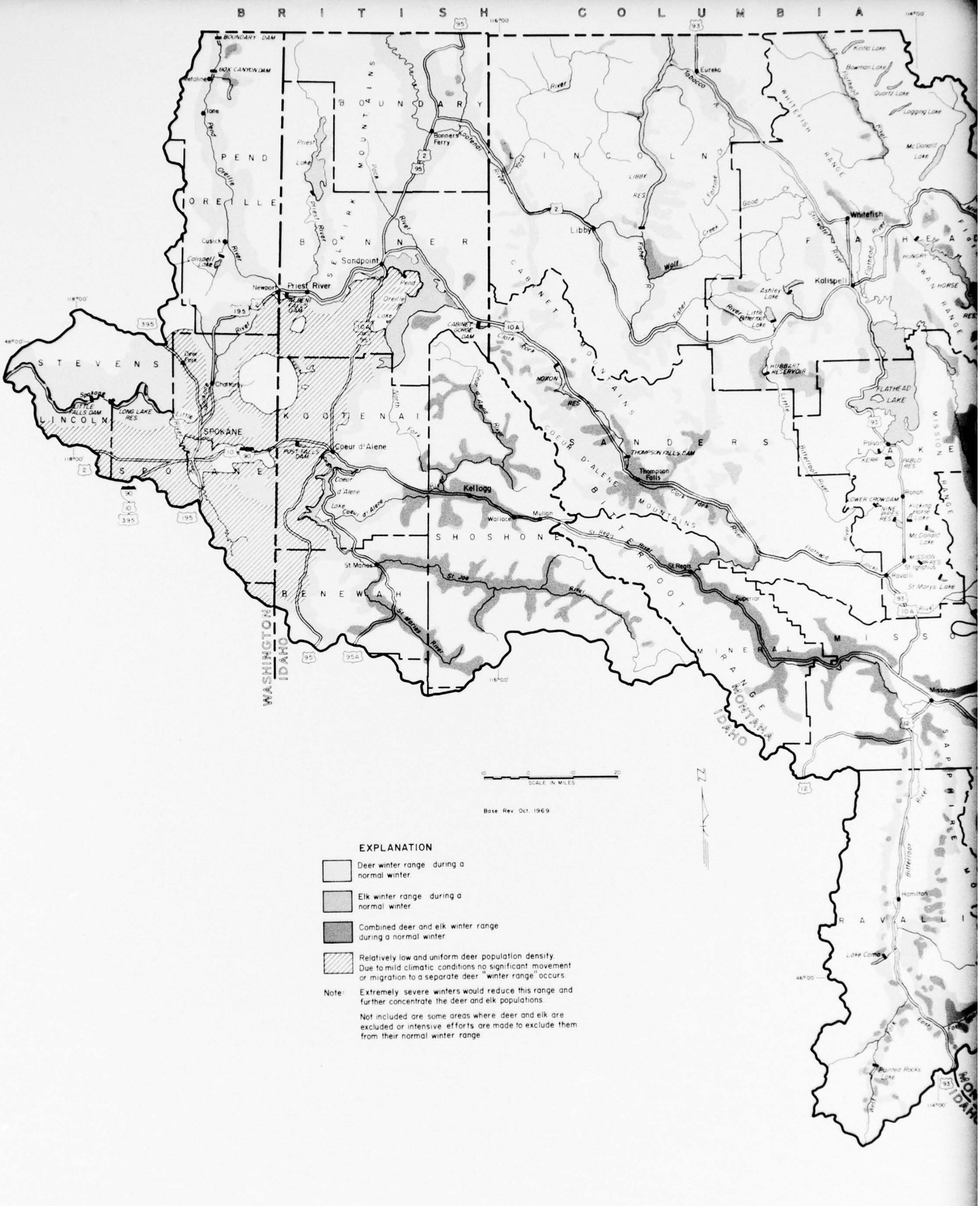
1/ Estimates based on data obtained from fish and game agencies of respective States.

Between 12,000 and 14,000 deer were harvested in the Montana portion of the subregion in 1965. The Idaho panhandle recorded a harvest of about 4,700 deer during the 1965 season. The Washington portion of the subregion provided a harvest of between 2,000 and 4,000 of these animals. Between 60 and 70 percent of the deer harvested are whitetails.

Elk, probably one of the most prized big game trophies available to hunters in a significant quantity, can be hunted throughout most of the subregion on general elk hunting licenses. The Montana portion furnished between 4,000 and 6,500 of these animals in 1965. Idaho reported a kill of about 1,700 elk in 1965. There were no elk harvested in northeastern Washington in recent years.

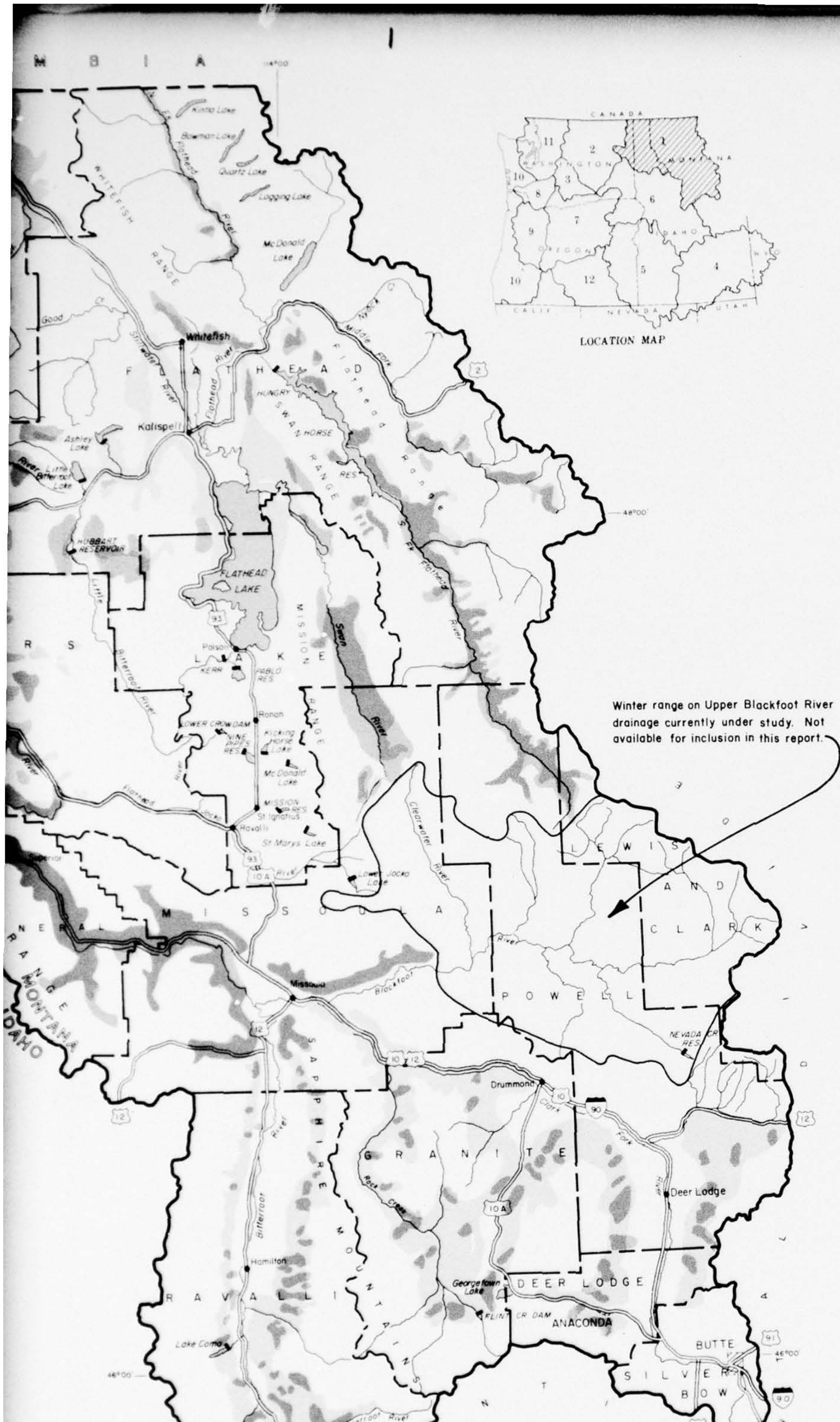
Montana hunters bagged an indicated 600 to 1,200 black bear in 1965. Idaho shows a harvest of about 1,000 of these animals. The two counties of Washington indicate a 1966 harvest of 260 black bear. Montana also recorded a harvest of 30 to 60 highly prized grizzly bear.

Moose are hunted on a permit basis in both Idaho and Montana. Under this system, hunters in western Montana harvested between 200 and 300 moose. Idaho reported the harvest of only one moose during the 1965 season.



BRITISH COLUMBIA
STEVENS
LINCOLN
SPOKANE
PEND OREILLE
BOUNDARY
BONNER
KOOTENAI
SHOSHONE
BENEWAH
LINCOLN
FLATHEAD
SANDERS
MINERAL
MISSOULA
LAKE
RAVALLI
WASHINGTON
IDAHO
MONTANA
SELKIRK MOUNTAINS
CABINET MOUNTAINS
COEUR D'ALENE MOUNTAINS
BITTERROOT RANGE
WHITEFISH RANGE
MISSION RANGE
SAPPHIRE MOUNTAINS
BOUNDARY DAM
BOX CANYON DAM
CABINET GORGE DAM
ALBENI FALLS DAM
NOXON RES
THOMPSON FALLS DAM
LIBBY RES
HUBBERT RESERVOIR
FLATHEAD LAKE
HUNGRY HORSE RES
KERR
PABLO RES
LOWER CROW DAM
NINE PIPES RES
LITTLE FALLS DAM
LONG LAKE RES.
POST FALLS DAM
Spokane
Sandpoint
Priest River
Newport
Bonners Ferry
Coeur d'Alene
Kellogg
Wallace
Mullan
St Maries
St Regis
Superior
Thompson Falls
Libby
Eureka
Whitefish
Kalispell
Polson
Ronan
St Ignatius
Ravalli
Missoula
Hamilton
Metaline
Ione
Cusick
Chattaroy
Priest Lake
Pend Oreille Lake
Coeur d'Alene Lake
Kintla Lake
Bowman Lake
Quartz Lake
Logging Lake
McDonald Lake
Ashley Lake
Little Bitterroot Lake
Flathead Lake
St Marys Lake
Lake Como
Painted Rocks Lake
St. Joe River
St Maries River
Clark Fork River
Bitterroot River
Kootenai River
Fisher River
Flathead River
118°00'
116°00'
114°00'
48°00'
46°00'
SCALE IN MILES
10 0 10 20
Base Rev. Oct. 1969
EXPLANATION
Deer winter range during a normal winter
Elk winter range during a normal winter
Combined deer and elk winter range during a normal winter
Relatively low and uniform deer population density. Due to mild climatic conditions no significant movement or migration to a separate deer "winter range" occurs.
Note: Extremely severe winters would reduce this range and further concentrate the deer and elk populations.
Not included are some areas where deer and elk are excluded or intensive efforts are made to exclude them from their normal winter range

2



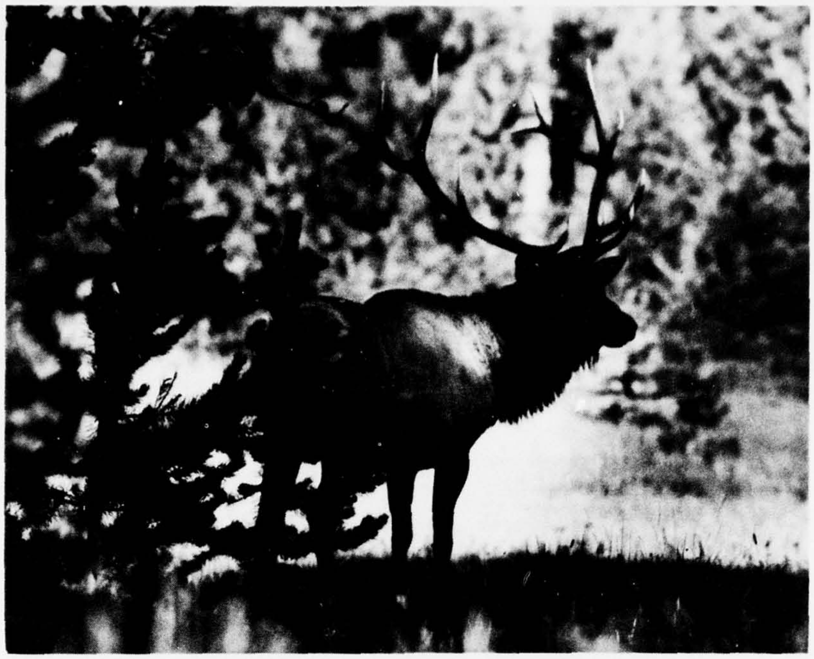
COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

DEER AND ELK RANGES

CLARK FORK, KOOTENAI, SPOKANE SUBREGION 1

1970

FIGURE 7



The elk is one of the highest valued big game animals. (Montana Department of Fish and Game)

Mountain goat are hunted in Montana and Idaho. Some of these hunts are on special permits only and others in remote, rugged areas have recently been open to all comers. The liberalization of goat hunting regulations is probably reflected in the Montana harvest. From a total kill in western Montana of 90 goats in 1963, the harvest has steadily increased to over 340 goats in 1966. Idaho reported a harvest of 15 goats in 1965.

Bighorn sheep are hunted in western Montana on a strict limited permit basis only. The harvest of bighorn sheep has varied from 5 to 17 per year during the period 1963 through 1966. Analysis of harvest data in Montana has shown that weather is the dominant influence on bighorn sheep and mountain goat harvest.

There is no universally accepted way to place a monetary value on the wildlife resource. Big game is possibly more difficult to evaluate than fish or furbearers because of the expenditure and effort an individual hunter is willing to put forth for a single animal. The subregion presents outstanding opportunities to observe, photograph, and study big game. As with fishing, big game hunting is of national as well as local importance.

The available big game resource is one of the main factors supporting the outdoor recreation industry. In 1965 hunters spent about $4,000,000 hunting big game. This indicates to some extent the importance of the resource.

Moose, bighorn sheep, and mountain goat are currently being hunted at capacity. While intensive management practices could expand their range, they will always fall far short of meeting the demand for the particular type of hunting these species provide.

Deer and elk hunting is still available to anyone willing to buy a license and expend the effort.

The grizzly bear can still be hunted without limiting hunters in Montana.

Recently considered rare the magnificent grizzly can still be seen and hunted in the subregion. (National Park Service)

Black bear offers the best opportunity for providing additional hunter-use capacity. At the present time, it cannot be predicted how many hunter-days present bear populations can ultimately sustain. It is certainly many times the current pressure being placed on that species.

Factors Affecting Resource

The key to supplying surplus animals for sport is providing adequate, healthy range. Factors that have tended to reduce available winter range are related to the animals themselves and man's activities.

Deer, elk, and bighorn sheep, being particularly tolerant of high population densities on winter areas, have in the past destroyed much of their own range. This, of course, was complicated in many instances by uncontrolled livestock utilizing the same range. The techniques of balancing forage with grazing animals have long been understood; however, the application of these principles has been obstructed and confused by segments of the public wanting various things. As a result, most of the subregion's game ranges have been badly overused at one time or another. Some of them are still being overused.

Browse plants, upon which most species of grazing game animals depend, represent subclimactic conditions. The outstanding job being done by the Forest Service fire suppression crews has prevented the return of many ranges to a subclimactic condition. Where forests are not being logged, and controlled burning is not being applied, plant succession is reducing available range. This is occurring in wilderness areas and sites not particularly suited to timber production.

The experiment to increase snow depths over areas which include critical winter ranges poses a threat to elk wintering in low lying areas of the Flathead River's South Fork drainage.

Mining and smelting activities have destroyed big game habitat.

Modern logging practices are opening dense stands of timber sometimes resulting in additional browse production, but much of this production is not available during the winter. Only those sites at lower elevations with the proper exposures are utilized as winter range areas. Controlled burning has been used in some cases to produce much needed winter range.

The construction of trails and roads throughout the subregion has made hunting easier and provided for a better harvest from areas previously inaccessible.

Goat and sheep have been reintroduced into areas they formerly occupied. Recognition of black bear as a full-fledged game animal rather than a "varmint" has been a major recent accomplishment. Now protected from indiscriminate, unlimited killing, the bear is providing widespread hunting opportunity. A similar recognition has

been accorded the mountain lion in Washington. Idaho has reached an understanding with the Canadian Government regarding the protection of the migratory caribou herd.

Upland Game

Upland game species include ring-necked pheasant, Hungarian partridge, chukar, valley quail, blue grouse, spruce grouse, ruffed grouse, sharp-tailed grouse, sage grouse, mourning dove, wild turkey, Wilson's snipe, snowshoe rabbit, and cottontail. The ptarmigan also occurs but is not hunted.

Habitat

Upland game species occupy a wide variety of habitat types ranging from agricultural land to mountain forests.

The pattern of small grain fields, pasture, and woodlots makes excellent habitat for pheasant, mourning dove, valley quail, and rabbit. Brushy creek bottoms also are an important element in their habitat.

Ruffed grouse inhabit brushy creek bottoms and appear to be totally dependent on that habitat type. They can be found there at all seasons.

Spruce grouse inhabit dense forests and lodgepole thickets of the mountains. These birds breed and nest in small forest openings.

Blue grouse inhabit more open mountain country, particularly during the breeding and nesting periods. In spring and summer, this bird is found at lower foothill elevations. At this time of year its distribution roughly approximates the winter range of deer and elk. During the fall blue grouse move up the slopes and winter in higher forested areas.

Small populations of sharp-tailed grouse and sage grouse inhabit the limited amount of prairie and sagebrush habitat available.

Turkey have shown a preference for the transition zone between valley grassland and the forested foothills. Dryland wheat farms and brushy creek bottoms in timbered areas appear to be important parts of their habitat.

Hungarian partridge prefer rolling, arid, sagebrush-bunchgrass areas associated with dry farming.

Chukar partridge prefer an arid habitat with a high percentage of talus slopes and rock outcroppings and about half sagebrush type. A narrow edge of brushy creek bottom is important. This habitat combination is in short supply.

Use

In 1965 hunters spent about 250,000 man-days hunting upland game. Table 15 shows hunting use by State.

Table 15 - Estimated Hunting Use of Upland Game, Subregion 1, 1965 1/

Hunter-Days			
Idaho	Montana	Washington	Total
50,000	100,000	100,000	250,000

1/ Estimates based on data obtained from fish and game agencies of respective States.

In Montana, over the 1962-64 seasons, the pheasant harvest fluctuated roughly between 18,000 and 30,000 birds and recorded changes of about 50 percent between some seasons. Washington had a 1966 harvest of about 10,000 birds in the two counties that lie primarily within Subregion 1. Data on the total harvest in these counties over a period of 5 years (1958-62) showed a take of between 15,000 and 20,000 pheasant.

The 1965 and 1966 harvest figures, for Spokane and Pend Oreille Counties in Washington, show approximately 31,000 and 21,000 grouse taken, respectively. These counties are predominantly in Subregion 1 and the harvest figure is a total for the three species under discussion.

Over a 3-year period, 1962 through 1964, between 44,000 and 64,000 ruffed grouse, between 25,000 and 30,000 blue grouse, and between 20,000 and 31,000 spruce grouse were harvested in western Montana. These figures show that the mountain grouse are the most important group of resident game birds in Washington, Montana, and probably the Idaho portion of the subregion.

The turkey is a newcomer to the subregion. Since only a few open seasons have been held on this particular species, harvest data covering a period of years are not available.

Chukar partridge have also been introduced. Montana has a harvest of between 160 and 500 birds annually and Spokane County in Washington had a take of about 30 in 1966.

The mourning dove is hunted in Washington and Idaho but has not attained game bird status in Montana. In 1966 Washington had a harvest of about 35,000 birds in Spokane and Pend Oreille Counties. Spokane County reported a harvest of 5,420 quail during the 1966 hunting season.

While rabbit are considered game animals in some States and not in others, they are hunted throughout the subregion. In Washington, where snowshoe and cottontail are considered game animals, a harvest of about 5,300 was recorded during the 1966 season. In other portions of the subregion, where hunting seasons are open year-round and no license is required to hunt them, harvest data are not available. It is believed that rabbits provide considerable recreation annually.

Upland game hunting obviously generates considerable economic activity annually. The ability of the species involved to produce high annual surpluses in their populations gives them the ability to withstand a high harvest rate. The basic biology of some species has only recently been understood or is currently being studied. Data accumulating on species such as blue grouse have shown that in optimum habitat they exist in population densities comparable to those observed in Dakota pheasant during their good years. Certainly an area that strives to meet the optimum requirements of its wildlife stands to reap tremendous economic benefits from the sport hunting and associated recreation those populations will sustain. Approximately $1,000,000 were spent for upland game hunting in the subregion in 1965.

Factors Affecting Resource

Changes in farming procedures have resulted in corresponding changes in wildlife populations inhabiting agricultural areas. Factors that alter the balance of habitat result in reduced wildlife populations. For example, the change in emphasis in Flathead Valley agriculture from grain to forage crops for livestock was accompanied by declining pheasant populations. Efforts to combat the decline with artificially reared pheasant and with harvest restrictions made little, if any, impact on the population trend. The widespread use of highly toxic, long-lasting pesticides has undoubtedly affected pheasant both directly and indirectly through curtailing their reproductive potential and survival. Intensification of agriculture utilizing edge areas and buffers of vegetation continues to further reduce pheasant and Hungarian partridge habitat.

Permanent flooding of river and stream bottoms on water storage projects eliminates some of the finest pheasant habitat.

Pheasant and Hungarian partridge have benefited from a few of man's recent activities. Irrigation projects usually provide good habitat that compensates for habitat flooded by the storage facility. Where offstream storage is provided, there is a definite gain in available habitat. In areas where nesting habitat was in short supply, the soil bank program materially aided the pheasant and partridge. In addition, orchard developments have often increased dove nesting habitat.

The pheasant hunter in Washington is obtaining additional hunting opportunity as a result of the harvest of hens in one area. In spite of their apprehensions, sportsmen are harvesting more birds with no discernible adverse effect on pheasant populations.

Blue and ruffed grouse and valley quail populations have been adversely affected by overgrazing key habitat areas. Blue grouse suffer from the effects of overgrazing on breeding, nesting, and brood-rearing areas. Much of this range, because of its foothill location, is utilized by both big game and domestic livestock. The ruffed grouse creek-bottom habitat is subjected to intensive use on most ranges utilized by domestic stock. The ruffed grouse, being almost totally dependent on this type of habitat, continues to lose ground not only because of overgrazing but also due to other intensive uses being made of floodplains. Some factors pointed out in the "Resident Fish" discussion as destroyers of trout streams are also diminishing ruffed grouse habitat.

Edge areas created by logging have sometimes benefited blue grouse and mourning dove. Selective cutting has been found to be more beneficial than block cutting. Orchard developments have often increased dove nesting habitat. Moderate grazing and development of stock-watering facilities may benefit valley quail.

The major dove problem concerns the attitude of the Montana legislature. Session after session, game bird status has been denied this bird. While this legal protection has not filled Montana to overflowing with doves, it has denied this recreational resource to Montana hunters.

Fur Animals

Furbearers include fisher, marten, mink, weasel, striped skunk, spotted skunk, river otter, badger, raccoon, red fox, coyote, lynx, bobcat, beaver, and muskrat. They range in geography and abundance from the rare, high-mountain dwelling fisher to the common lowland marsh-dwelling muskrat. Perhaps the most important species from the

standpoint of harvest and market value are the beaver, mink, and muskrat.

Habitat

Beaver, mink, raccoon, and muskrat are widely distributed along watercourses throughout the subregion. Lower gradient streams, ponds, and marshes produce the most muskrat. Although less abundant, the otter is another furbearer totally dependent on the aquatic environment.

Coyote, bobcat, lynx, badger, weasel, and skunk are widely distributed throughout the subregion. Marten, fisher, and wolverine occur in the more remote areas of the Montana and Idaho forests.

Use

About 32,000 animals are trapped annually. The 1965 catch consisted of approximately 6,000 beaver, 2,200 mink, 23,000 muskrat, 550 bobcat, 175 lynx, 120 coyote, 100 red fox, 40 otter, and 30 marten. A few badger, raccoon, weasel, and skunk also were trapped. Fisher and wolverine are rare, and few were taken.

The importance of furbearers to the subregion is difficult to determine. The value of hides sold in recent years is about $135,000 annually. The true value of these animals, however, does not lie in money obtained from the sale of their hides any more than the value of fish or game can be judged in pounds of consumable flesh produced. This is perhaps best exemplified by the scarce wolverine. On the fur market its pelt brings about $12; but few taken ever reach the fur house. A flat mount costs between $60 and $80; yet, this is what happens to most of them. The hunter or trapper consequently values them considerably higher than the pelt price. This is also the case for species not as rare, like the bobcat, lynx, and even the coyote.

Perhaps of even greater economic importance is the pleasure these animals provide wildlife observers. To observe otter playing along a river, or beaver working in their ponds certainly adds to the outdoor experience of fishermen, hunters, and sightseers. This opportunity undoubtedly encourages many vacationers and sportsmen to select this area for their recreation.

Many of the furbearers are also hunted for sport. Since this type of hunting usually requires no license, the number of participants in this form of recreation and the time they devote to it is unknown but probably is increasing.

These animals are important native fauna. Destruction of their habitat or elimination of their populations could result in a chain of events leading to still further undesirable changes in the flora and fauna of the area.

Factors Affecting Resource

The major factor limiting beaver numbers is unavailability of habitat. The primary detrimental factors are lack of food and high stream gradients. Where adequate habitat is available, populations are sometimes limited because of their conflict with irrigated agriculture and urban sprawl. Beaver are also removed from larger lakes and streams when their activities cut off important trout spawning tributaries.

Mink and otter habitat is closely allied to natural stream habitat, and factors that reduce the amount of streams or alter their character may also reduce the mink and otter populations. These factors include channel destruction, impoundment, dewatering, streambank cover destruction, and pollution.

Muskrat suffer from drought, disease, pond drainage, and conflicts with irrigated agriculture. The low price per pelt apparently is not enough to stimulate trapping.

Management techniques enabling trappers to crop annual surpluses and maintain healthy populations benefit beaver, mink, and muskrat more than any other factor except habitat retention. Muskrat also benefit from some water developments, particularly when stable water levels are maintained.

Waterfowl

Waterfowl species composition within the subregion varies with the season. Ninepipe and Pablo National Wildlife Refuges have the following species nesting on their refuges: Canada goose, mallard, redhead, pintail, baldpate, shoveler, blue-winged teal, green-winged teal, ruddy duck, gadwall, merganser, and coot. The situation on these refuges, while not inclusive of all species that incidentally occur in the subregion, is probably typical of the major waterfowl habitat in Subregion 1. While not known as a principal wintering area for waterfowl, certain species do winter in the open water, particularly during mild winters. The bulk of wintering populations is made up of mallard, redhead, goldeneye, and Canada goose. The mallard makes up over half of all waterfowl taken each year.

Habitat

Subregion 1's principal role in the waterfowl picture is to provide resting, feeding, and harvest habitat for waterfowl migrating

from Canadian and Alaskan nesting grounds to southern wintering areas. Some waterfowl nesting is associated with the subregion's river habitat in the pothole country of the Flathead and Blackfoot Valleys, in the lake and pothole country of Spokane County, and on the managed waterfowl refuges.

Use

Waterfowl hunting use in 1965 was about 100,000 man-days. Table 16 shows an analysis of hunting for ducks and geese in the subregion by State.

Table 16 - Estimated Hunting Use of Waterfowl, Subregion 1, 1965 1/

Hunter-Days			
Idaho	Montana	Washington	Total
20,000	50,000	30,000	100,000

1/ Estimates based on data obtained from fish and game agencies of respective States.

The liberal seasons, bag limits, and hunting conditions during recent years have resulted in considerable hunter use of waterfowl originating from and migrating through Subregion 1. In the Montana portion of the subregion, hunters harvested about 65,000 ducks in 1962 and approximately 82,000 in 1963. Waterfowl harvest is highly variable depending on a variety of biological and climatic conditions. Idaho had an average annual harvest of approximately 475,000 ducks, 19,300 Canada geese, 800 snow geese, and 9,300 coots over a 10-year period, 1954-64. These figures are totals for Idaho; the greatest share of this harvest occurs in southern Idaho outside of Subregion 1. Washington waterfowl hunters harvest approximately 35,000 ducks and 2,000 geese annually in its portion of the subregion.

Approximately $1,000,000 was spent for waterfowl hunting in 1965 in the subregion.

More local hunting opportunity could be provided by additional waterfowl developments to hold migrants longer during fall migrations. Additional birds to provide additional hunting will be largely dependent on events occurring outside the subregion on summer nesting and on wintering areas.

Factors Affecting Resource

Waterfowl use is limited by availability of suitable resting and feeding areas for migrating populations. This factor, more than any other, currently limits the harvest within the subregion.

Although the subregion was never a major producer of waterfowl relative to the entire flyway, its capacity to produce has suffered due to changes made by man. River habitat that was used for nesting waterfowl, particularly island-nesting Canada geese, has been greatly diminished by impoundments and alteration of natural channels.

The limited pothole habitat which once was, and could again be, important locally has suffered from drainage, overgrazing, and intensive agricultural uses imposed on the land.

Breeding grounds in Canada and Alaska producing the subregion's birds are in good supply and condition. There is no assurance, however, that this condition is static or destined to remain. Should projects such as Rampart Dam or undertakings of the North American Water and Power Alliance magnitude reach the construction phase, the waterfowl supply could be seriously affected.

Land acquisition programs have resulted in the purchase and management of critical duck and goose nesting habitat. Development of management areas has also provided public shooting grounds. Duck banding studies have resulted in relatively accurate flyway boundaries that fit the biology of the species being managed.

Other Wildlife

Other wildlife not included under previous headings are none the less important to those who enjoy them. The list of species undoubtedly would be lengthy and range from a tiny hummingbird of immense value to a bird watcher, to the mountain lion currently dwelling in limbo between "varmint" and game animal. Little or no meaningful information is available on the needs and requirements of these wildlife forms.

Hunting use data are also not available. However, such use in the subregion is estimated to be less than 10 percent as great as hunting for game species.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

Subregion 1 is uniquely endowed to absorb a substantial increase in use of its fish and wildlife resources. However, to assume this position, it is essential that the needs of the animals be met so that they in turn can meet human needs. The key to meeting the ultimate human demands on these resources is to meet fish and wildlife habitat requirements. These requirements will be the same in 1980, 2000, and 2020 as they are today--living space, cover, food, and water.

To expand total animal numbers in the target years, it is necessary to expand the habitat base that supports them. Since projected "needs" of other functions are competing for this same land base, animal population enhancement will be difficult to attain. Means for retaining or increasing present fish and wildlife resources are indicated in the following discussions.

Fishing

Habitat Preservation

As a planning goal, retention of stream and natural lake fisheries over less desirable reservoir fisheries has been promoted in Subregion 1. To continue this effort and meet future demands, it is essential that most existing aquatic habitat be retained. Areas needing protection include tributaries to large natural water bodies such as Flathead, Pend Oreille, Priest, and Coeur d'Alene Lakes. These tributaries are important not only for sport fish spawning, but also as brood and rearing areas for several extremely valuable species such as Montana westslope cutthroat trout and Dolly Varden.

Perhaps leading the list of stream habitat in need of preservation are the North Fork, Middle Fork, and remaining reaches of the South Fork of the Flathead River. These tributary systems need protection not only from impoundment but also from water quality degradation which usually accompanies excessive roadbuilding and clear-cutting timber in virgin watersheds. In the Flathead River's several watersheds, it is essential to preserve even the smallest tertiary tributaries. It is in these tributaries that young Montana westslope cutthroat and Dolly Varden live for several years before migrating to Flathead Lake and/or Hungry Horse Reservoir where they encounter massive fishing pressure. In preserving trout stream habitat, there are three major areas of concern: protecting the stream channel, safeguarding the immediately adjacent floodplain, and maintaining desirable watershed characteristics.

Habitat Improvement

Habitat improvement opportunities exist throughout Subregion 1. The greatest need for expanding the aquatic habitat lies adjacent to population centers where most anglers reside. In Washington there are opportunities to create single purpose impoundments to accommodate more anglers. Examples of such opportunities in Pend Oreille County include:

Location	Development
Big Muddy Creek	build dam to create a 300-acre lake on national forest land
South Fork, Lost Creek (Rufus Meadows areas)	build dam to create a 1,000-acre lake on national forest land
Flat Creek (Priest River drainage)	build dams to create 4 lakes totaling 300 surface acres
Bunchgrass Meadows	build dams to create a 100-acre and a 60-acre lake
Ruby Creek	build dams to create two lakes totaling more than 80 surface acres on national forest lands
Unnamed tributary, Lower West Branch Priest River	build dam to create a 100-acre lake on national forest land

In addition to creating these new water bodies there are opportunities for reclaiming some of Washington's existing lakes, streams, and reservoirs that are currently infested with rough fish populations. The major obstacle to this measure is development of a potent, yet biodegradable, fish toxicant that can be safely used in such reclamation work.

Through the rest of Subregion 1, habitat improvement should include augmenting badly depleted streamflows such as in the lower Bitterroot River, i.e., a need for 150-cfs flow from Woodside to Florence, Montana, during late summer. Substantial improvement in water quality will also enhance many areas. Water storage measures undertaken to meet streamflow needs would not be detrimental to upstream fish and wildlife resources. Water currently degraded by silt, dissolved heavy metals, or excessive nutrients can generally be improved by strictly enforcing the nondegradation policy embodied in the 1965 Water Quality Act. Specific areas needing treatment include:

- Lower Ashley Creek from Kalispell, Montana, to mouth
- Clark Fork from Anaconda through Missoula, Montana
- South Fork Coeur d'Alene River (entire drainage)
- Spokane River from Coeur d'Alene, Idaho, to Franklin D. Roosevelt Lake
- St. Maries River from Clarkia to St. Joe River confluence

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 17.

Greater Harvest

Potential for greater harvest generally exists throughout the subregion. For example, warmwater fish are underharvested and would benefit from increased use. However, it appears highly unlikely that this fishery will become decidedly more acceptable or important through year 2020.

In general, fish stocks in large standing water bodies are underutilized. There is no evidence that any species inhabiting the big lakes are suffering from overharvesting. In fact, Flathead Lake's large whitefish population is virtually unharvested and the lake's kokanee populations could probably be improved with increased harvest.

Fishing regulations are extremely liberal. If the habitat that produces this abundant resource is maintained, angler use of these waters could be increased considerably. The point at which angler harvest becomes a limiting factor is not known, but it is currently considered to be one of the lesser resource management problems.

A greater harvest could also be achieved by improving fisherman access in certain parts of the subregion. Access should be acquired wherever possible; however, site development must be approached cautiously lest quality or the total angling experience is degraded. It is also important to cautiously evaluate access problems when dealing with rare or endangered species such as the Montana westslope cutthroat trout. Such species may be susceptible to overfishing but, at present, they persist because their remaining habitat is generally remote. Opening vast blocks of de facto wilderness area or making easy access to all streams would represent a threat to this species.

Augmentation of Supply

The potential for increasing angler-days through artificial propagation exists wherever a water supply is available. If anglers

Table 17 - Fish Habitat Improvement Means, Subregion 1

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Stream improvement	mile	280	504.0	360	648.0	340	612.0
Spawning bed improvement	mile	1	1.5	1	1.5	1	1.5
Rough fish removal (streams)	mile	6	--	6	--	6	--
Rough fish removal (lakes)	acre	3,000	3.0	3,000	3.0	3,000	3.0
Stream channel preparation	mile	4	64.0	2	32.0	4	64.0
Lake improvement	acre	810	810.0	1,040	1,040.0	1,040	1,040.0
Sub-totals			1,382.5		1,724.5		1,720.5
Planning							
Fish stream surveys	mile	2,460	74.0	Not available		Not available	
Fish lake surveys	acre	10,670	53.0	Not available		Not available	
Sub-total			127.0				
Total			1,509.5				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement							
Stream	mile	140	1,815	200	3,055	200	3,055
Lake	acre	8,828	1,079	5,988	478	9,305	751
Fish lakes	acre	1,200	1,800	2,000	3,000	2,500	3,750
Totals			4,694		6,533		7,556

are willing to pay, fishing can be provided anywhere through modern fish cultural techniques. Artificial propagation probably best fits the total picture where water bodies are without natural spawning habitat and the hatchery acts as a substitute for natural propagation. The other extreme is rearing fish to catchable size and placing them before the angler in the hope that he will catch them in a short period of time.

Hunting

Means to satisfy future hunting needs in Subregion 1 are limited predominantly to preservation of existing habitat, especially winter ranges and wetlands, reclaiming historical game ranges, acquiring and managing key wildlife areas, and providing sufficient space for people to use and enjoy wildlife.

Habitat Preservation

Considerable opportunity exists to preserve valuable wildlife habitat. Potentially valuable waterfowl pothole areas can be found in:

Flathead River Valley
- North of Flathead Lake
- Near Pablo, Montana, south of Flathead Lake
- Smith Lake on Ashley Creek (Flathead River tributary)

Kootenai River Valley
- Near Eureka, Montana
- Between Bonners Ferry, Idaho, and the Canadian boundary

Western Spokane County
- Pend Oreille River - Calispell Lake area

Further studies are required to evaluate the relative importance of the areas and to justify retaining some of them.

Upland game areas suitable for preservation have been identified near Rexford, Montana, adjacent to Libby Reservoir, and approximately 8,500 acres of selected scattered habitat and management hunting sites are located in Spokane and Pend Oreille Counties, Washington. At least one upland game bird, the sharp-tailed grouse, is currently in danger of extirpation in this subregion. Since these birds do not readily adapt to changing environments, specific areas critical to their survival should be set aside for their use. Such an area exists near Eureka, Montana. Undoubtedly, future studies will identify additional habitat preservation needs for game birds.

Since most hunters living in Subregion 1, and virtually all nonresident hunters prefer big game hunting, preservation of key big game winter ranges (figure 7) is paramount in planning for the Montana and Idaho portion of the subregion. Because of mountainous terrain and relatively harsh climatic conditions, these big game winter ranges, once lost, cannot be replaced. In Washington, approximately 24,500 acres have been tentatively identified in long range planning endeavors for purchase or lease. Big game densities in the Washington portion of the subregion are directly related to the availability of range below 3,000 feet in elevation for undisturbed use by big game during critical winters.

Preservation of key winter range is paramount in planning for big game. (Montana Department of Fish and Game)

Habitat preservation for wildlife is perhaps even more critical with some of the rather scarce species, specifically grizzly bear and bighorn sheep. Habitat of both these animals is experiencing severe reduction. Elk are also susceptible to drastic environmental changes such as those related to logging in de facto wilderness areas and massive impoundments such as Libby Dam project. To maintain significant numbers of such wilderness oriented species, it is important to rapidly reevaluate what is being done on large blocks of public land. Habitat preservation for species that inhabit either officially designated or de facto wilderness areas without legal protection is urgent. Each year sizeable habitat reduction occurs

in spite of multiple use concepts. Generally this habitat reduction is attributable to the single purpose of getting more logs out of the forest cheaply.

Habitat Improvement

This improvement can best be accomplished by devoting key areas previously identified (figure 7) to single purpose use for big game animals. At present it is generally agreed that winter range is the primary factor limiting big game numbers. However, the extent to which big game herds can expand from a single purpose winter range is not known. Specific land management practices for big game are discussed in detail under the headings: "Ecosystem Manipulations;" "Timber Management for Big Game;" "Browse Farming;" "Zoning for Big Game;" "Control of Livestock Grazing;" and "Use of Mechanical Devices," in the "Regional Summary," "Means to Satisfy Needs." These discussions are applicable throughout Subregion 1 text.

A waterfowl management program includes establishment of small sanctuary and feeding areas to provide better control of waterfowl movements and to alleviate depredation problems. More detailed discussion of specific land management practices for waterfowl, i.e., providing essential food, water, and cover, can be found in the "Regional Summary," "Means to Satisfy Needs." These management practices are equally applicable in Subregion 1.

Habitat improvement opportunities also exist for other forms of wildlife that have achieved a degree of compatibility with human land use. These opportunities are generally related to costs or the amount of another use man is willing to sacrifice to accommodate various wildlife forms. Since habitat improvements generally must be accomplished on fertile, low elevation lands, the principal obstacle is man's competitive activity.

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are included in table 18.

Greater Harvest

Greater harvest opportunities certainly exist within Subregion 1. Large numbers of mourning dove could be harvested if the ban against dove hunting was lifted in Montana. Most big game species can probably provide greater harvests, with the possible exception of grizzly bear and elk. Certainly, a greater number of hunter-days could be accommodated once hunters become willing to accept a reduced success to unit of effort ratio. Among big game animals, black bear undoubtedly offer the greatest opportunity for

Table 18 - Wildlife Habitat Improvement Means, Subregion I

Measure	Unit	Federal 1980 Amount	Federal 1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Seeding and planting	acre	4,890	129.0	6,210	165.0	6,200	164.0
Forage release & prescribed burning	acre	12,500	24.4	15,800	30.4	15.800	30.4
Key area fencing	mile	10	10.0	30	30.0	20	20.0
Permanent openings	acre	3,930	590.0	5,060	759.0	5,050	758.0
Wildlife food crops	acre	550	7.4	450	6.1	575	7.8
Guzzlers	each	10	10.0	--	--	--	--
Shallow impoundments and marsh improvements	acre	420	96.0	490	124.0	490	124.0
Develop potholes	each	40	4.0	60	6.0	50	5.0
Develop nesting facilities	each	130	7.0	180	9.0	170	9.0
Sub-totals			877.8		1,129.5		1,118.2
Planning							
Big game range analysis	acre	1,086,200	163.0	Not available		Not available	
Upland game habitat surveys	acre	5,200,000	208.0	Not available		Not available	
Habitat management plans	each	37	10.0	Not available		Not available	
Sub-total			381.0				
Total			1,258.8				

Measure	Unit	Non-Federal 1980 Amount	Non-Federal 1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement1/	acre	65,000	1,006	98,000	1,515	134,000	2,019
Land acquisition2/	acre	15,000	2,622	11,000	1,689	24,000	3,758
Fencing3/	mile	7	8	11	12	23	22
Water developments4/	each	63	4	40	3	84	5
Totals			3,640		3,219		5,804

1/ Includes cover plots, food patches, fencing, marsh development, potholes, nest structures, etc., not identified specifically in the table.

2/ Obtained by fee purchase and easement rights.

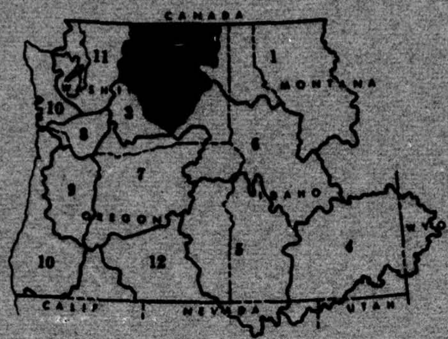
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land.

4/ Consists primarily of guzzler installations and spring development (including fencing) by agreement on private land (can include nest structures in other subregion).

increased harvest. Species such as mountain grouse could also sustain a greatly increased harvest especially during high points in population cycles.

Augmentation of Supply

Wildlife does not lend itself to artificial production as readily as do fish. Consequently, using game farming techniques to increase the supply of targets for hunters offers less potential than fish hatcheries. Hunters, however, will demand greater use of pen-reared game if habitat quality and quantity continues to decline. One approach to artificial production is construction of what might be termed optimum habitat areas where wildlife populations could develop in a more or less wild condition. These sites would be limited by availability, quality, and productivity of this space. The proposition of winter feeding of big game is a much debated point that certainly cannot be resolved in this study, but should not be ignored. It has been adequately proven that elk can be sustained through severe winters with artificial feeding programs. To sustain large numbers of game by artificial measures may be worthwhile if herds are being harvested to capacity. When the optimum portion of the population is used by hunting, increasing the size of the herd through alleviation of habitat deficiencies (nutrition in this instance) appears to be a practical means of meeting increased demands for hunting in the future. It has also been demonstrated that when feedlot conditions develop, natural range deterioration generally accompanies such programs and ultimately the entire population becomes totally dependent on handouts each winter. While the technique works, there can be no question that results are inferior to wild populations existing on natural range managed to serve as wintering areas.



LOCATION MAP

SUBREGION 2

S U B R E G I O N 2, U P P E R C O L U M B I A

GENERAL DESCRIPTION OF SUBREGION

Nearly 400 miles of Columbia River exist within the subregion. The Columbia is the second largest river in volume discharge in the conterminous United States. Its discharge throughout the year is generally more uniform than other large rivers in this country primarily because its tributaries are supplied by glaciers and slow melting snowpacks at higher elevation. This inherent water level stability once made this river one of the most productive natural watersheds in the country for both anadromous and resident fish.

The Upper Columbia Subregion includes roughly the Columbia River and tributaries from the Washington-Canadian boundary south to the Yakima River. It is approximately 195 miles long, 100 miles wide, and encompasses nearly 14.5 million acres. The subregion's northern half makes up most of what is termed Okanogan Highland Province and the southern half includes part of the Columbia Lava Province. The Okanogan Highlands are a series of north-south oriented valleys separated by small mountain ranges. These fingerlike mountainous projections, paralleled by fertile valleys and farmlands with their accompanying "edgelands," form the backbone of some of the finest big game habitat in Washington. The Columbia Lava Province is a relatively level plateau cut by two major northeast-southwest oriented coulees, Moses and Grand. These were once Columbia River channels.

Aquatic and terrestrial habitats are extensive and diversified. Terrestrial life zones include Arctic Alpine, Pacific Conifer Forest, Montane-woodland-brush, Grasslands, and Northern Desert Scrub. Aquatic habitats range from large manmade reservoirs such as the 81,000-acre Franklin D. Roosevelt Lake to small duck ponds and a myriad of irrigation canals. High mountain lakes and undisturbed mountain streams are abundant in the Okanogan Highlands and along the Cascade's eastern slope. This variety of settings and the moderate climate make it suitable for a variety of fish and wildlife and attracts sportsmen from other parts of Washington and the Nation.

HISTORY OF FISH AND WILDLIFE

The historical role played by wildlife in man's early exploration and settlement in Subregion 2 is not unlike the story of western

exploration itself. The search for valuable beaver pelts brought men into the upper reaches of the Columbia River early in the 1800's. Sir George Simpson wrote in 1824 of "...about 9,000 beaver of all sizes..." taken in the area and that the "...country is a rich preserve of beaver..." In 1825, the Hudson Bay Company established Fort Colville on the Columbia River's east bank. An era of extensive fur trade ended about 1845, being followed by mining, agriculture, and lumbering. Each pursuit had its own effect on the subregion's fish and wildlife.

Water development projects for irrigation, mining, and sawmill ponds were common by 1889. Little thought was given to fish and wildlife conservation and as a result anadromous fish were blocked from many historical spawning grounds and runs began to decline. Indian fisheries were extensive during this period and trading for fresh and dried fish products was common among the settlers and various tribes. The abundant anadromous fish were important in the subregion's settlement.

Although many initial management attempts faltered, progress toward modern biological management practices started in the 1930's. Under such practices fish and wildlife began to recover. Dramatic changes were sometimes noted. Beaver were extremely uncommon around the turn of the century, but by the late 1930's some regulated trapping was again allowed where these animals were causing damage. Settlement and development probably indirectly benefited big game throughout the subregion. Logging, fires, and agricultural practices created large areas of prime big game habitat or "edgeland." Such habitat contributed heavily toward successful "invasion" by the edgeland oriented white-tailed deer. Deer populations increased steadily, apparently not stabilizing until between 1940 and 1945.

After scientific management practices were established, the first great blow to the Upper Columbia River's fish and wildlife was the construction of Grand Coulee Dam. While approximately 250 linear stream miles were actually inundated by Franklin D. Roosevelt Lake's rising waters, over 1,140 stream miles including Canadian waters were blocked to anadromous fish by this dam.

Attempts were made to mitigate anadromous fish losses by building fish hatcheries on tributary streams. Efforts to restore anadromous fish stocked in the upper Columbia have been and are a continuing project.

PRESENT STATUS

All groups of fish and wildlife are represented in the subregion. Most groups are generally well distributed. With few

exceptions fish and wildlife harvests under present management practices are considered maximum for the quality of recreational use now realized. The most significant factors affecting these resources are man's increasing demands on land and water resources, which compete directly with fish and wildlife needs.

Lake and reservoir fisheries are probably adequate to meet present demands. These resources annually provide more than 2 million angler-days. It is highly improbable that additional reservoir fisheries will be needed prior to the year 2020. Most of the larger, high-quality river fisheries have already been damaged or completely destroyed by major water development. Heavy increases in fishing pressure on many remaining streams have made them less attractive to fishermen seeking solitude. However, small watersheds with quality fishery potentials are located throughout the subregion.

The subregion contains important wildlife resources. Some benefits from major water development projects have been realized, but habitat disturbance or destruction currently threatens to eliminate several species of fish and wildlife from the subregion's fauna. Sage grouse, Columbian sharp-tailed grouse, bald eagle, peregrine falcon, mountain lion, long-billed curlew, and several salmon species are under intensive pressure from "civilization."

The disproportionately high resource utilization indicates the subregion's importance to Washington's hunting and fishing. Both State and Federal agencies have recognized this importance. Figure 8 shows the extensive holdings of fish and wildlife interests. Their magnitude attests to the importance placed on the Upper Columbia. Although these holdings exist, many are not permanent arrangements and lack the desired degree of future security.

Washington Department of Game or the Bureau of Sport Fisheries and Wildlife control approximately 373,000 acres on the 18 major wildlife facilities found in Subregion 2. Unfortunately less than 200,000 acres of these controlled wildlife lands are owned by fish and wildlife interests. Nearly 50 percent are managed under agreements, some of which are short term leases that can be terminated at the owner's option. Obviously, this is not a satisfactory arrangement from a wildlife management standpoint. Management agencies hesitate to spend funds for habitat improvements and other developments on lands that they may soon lose. Table 19 lists lands owned and those occupied by agreement.

As a further measure of the subregion's importance, State and Federal wildlife management agencies also have 11 fish rearing facilities ranging in size from 3.5 to 187.5 surface acres; over 100 public lake and stream fishing access sites; and other areas such as administrative sites, small game habitat improvement plots, and fish habitat improvement sites.

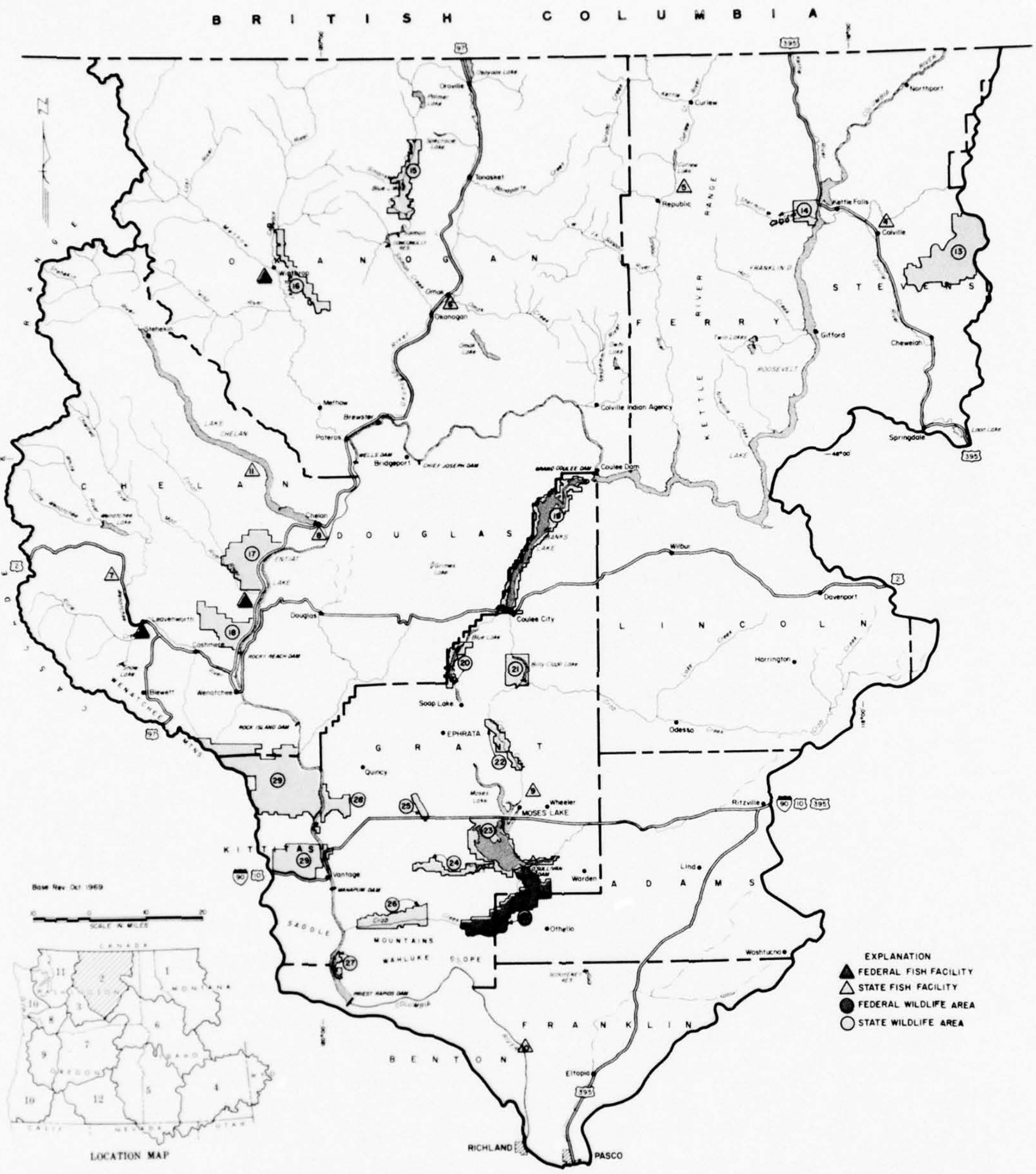
FIGURE 8. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965 Acres	Area or Fish Production - 1965 Pounds
1	Winthrop National Fish Hatchery		93,000
2	Entiat National Fish Hatchery		62,000
3	Leavenworth National Fish Hatchery		132,000
4	Colville Fish Hatchery		2,039
5	San Poil Fish Hatchery	Presently inactive	
6	Omak Fish Hatchery		8,885
7	Chiwaukum Fish Hatchery	Presently inactive	
8	Chelan Fish Hatchery		31,828
9	Columbia Basin Fish Hatchery		109,954
10	Ringold State Fish Hatchery		22,693
11	25 Mile Creek Spawning Channel		1/
12	Columbia National Wildlife Refuge	29,606.38	
13	Little Pend Oreille Wildlife-Recreation Area	43,000 (ap.) 2/	
14	Sherman Cr. Wildlife-Recreation Area	7,361.36	
15	Sinlahekin Wildlife-Recreation Area	11,651.07	
16	Methow Wildlife-Recreation Area	11,667.47	
17	Entiat Wildlife-Recreation Area	36,815 (ap.)	
18	Swakane Wildlife-Recreation Area	26,000 (ap.)	
19	Banks Lake Wildlife-Recreation Area	43,541.17	
20	Lake Lenore Wildlife-Recreation Area	6,510.22	
21	Stratford Wildlife-Recreation Area	6,225.46	
22	Gloyd Seep Wildlife-Recreation Area	6,072.55	
23	Potholes Wildlife-Recreation Area	40,235.00	
24	Frenchman Hills Wildlife-Recreation Area	3,520.00	
25	Winchester Wildlife-Recreation Area	1,828.00	
26	Crab Creek Wildlife-Recreation Area	17,000.00	
27	Priest Rapids Wildlife-Recreation Area	2,195.87	
28	Quincy Wildlife-Recreation Area	11,484.27	
29	Colockum Wildlife-Recreation Area	115,328.54 3/	

1/ 116,000 fry.

2/ Estimated portion of this wildlife-recreation area within the boundaries of Subregion 2 - the remainder is in Subregion 1.

3/ Estimated portion of this wildlife-recreation area within the boundaries of Subregion 2 - the remainder is in Subregion 3.



COLUMBIA – NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

UPPER COLUMBIA SUBREGION 2

1970

FIGURE 8

Table 19 - Public Lands Managed for Wildlife, Subregion 2

Facility	Acreage Controlled	Owned	Agreement
Little Pend Oreille Wildlife-Recreation Area	44,788	44,788	None
Sherman Creek Wildlife-Recreation Area	7,361	6,721	640
Sinlahekin Wildlife-Recreation Area	11,651	8,338	3,313
Methow Wildlife-Recreation Area	11,668	8,630	3,038
Entiat Wildlife-Recreation Area	8,747	1,791	6,956
Swakane Wildlife-Recreation Area	8,318	8,318	None
Colockum Wildlife-Recreation Area 1/	112,364	68,719	43,645
Lake Lenore Wildlife-Recreation Area	6,510	None	6,510
Stratford Wildlife-Recreation Area	6,226	291	5,935
Banks Lake Wildlife-Recreation Area	43,541	41	43,500
Gloyd Seep Wildlife-Recreation Area	6,073	2,747	3,326
Potholes Wildlife-Recreation Area	40,235	None	40,235
Frenchman Hills Wildlife-Recreation Area	3,520	None	3,520
Winchester Wasteway Wildlife-Recreation Area	1,828	None	1,828
Crab Creek Wildlife-Recreation Area	17,000	12,750	4,250
Priest Rapids Wildlife-Recreation Area	2,154	1,879	275
Quincy Wildlife-Recreation Area	11,484	7,341	4,143 2/
Columbia National Wildlife Refuge	29,606	25,523	4,083
Totals	373,074	197,877	175,197

1/ In addition, 1,575 owned acres are located in Subregion 3.
2/ Occupied by perpetual easement.

Landholdings of other agencies and private individuals also tend to underline the fish and wildlife importance of this subregion. About 3,600,000 acres of national forest lands with many habitat improvement sites and 98,500 acres of national park lands are open to the public for recreational purposes including the enjoyment of fish and wildlife. An estimated 725 private farm ponds have been constructed in the subregion. These furnish about 500 acres of wildlife habitat and approximately 10 percent of these ponds are managed for fish production. Properly constructed and managed, they can produce 50 to 200 pounds of fish per acre annually, satisfying the fishing needs of a section of the public. Subregion 2 currently has three privately-owned commercial trout producers and four fee-fishing enterprises.

Expenditures associated with recreational use of fish and wildlife amounted to about $22,280,000 in 1965. These activities provided about 4,073,000 recreational user-days. Additional fish and wildlife values stem from the commercial uses of anadromous fish and furbearers.

Anadromous Fish

Anadromous fish are of great importance in this subregion; however, most of the production is harvested in other areas. Because of the widely dispersed harvest of subregion stocks of fish, a regional analysis of the present status is presented in the "Regional Summary."

Resident Fish

Game fish species found in the Upper Columbia Subregion include: rainbow, brook, brown, and cutthroat trout; Dolly Varden, kokanee, whitefish, white sturgeon, burbot, largemouth and smallmouth bass, perch, crappie, walleye, catfish, and sunfish. Nongame fish species include squawfish, carp, chub, sucker, shiner, tench, stickleback, and sculpin.

Habitat

Subregion 2 provides about 288,000 surface acres of natural lakes, reservoirs, rivers, streams, and irrigation canals. These generally provide good habitat for game fish. The Columbia Basin Project has created many lakes, reservoirs, canals, and wasteways that provide habitat for resident fish.

Use

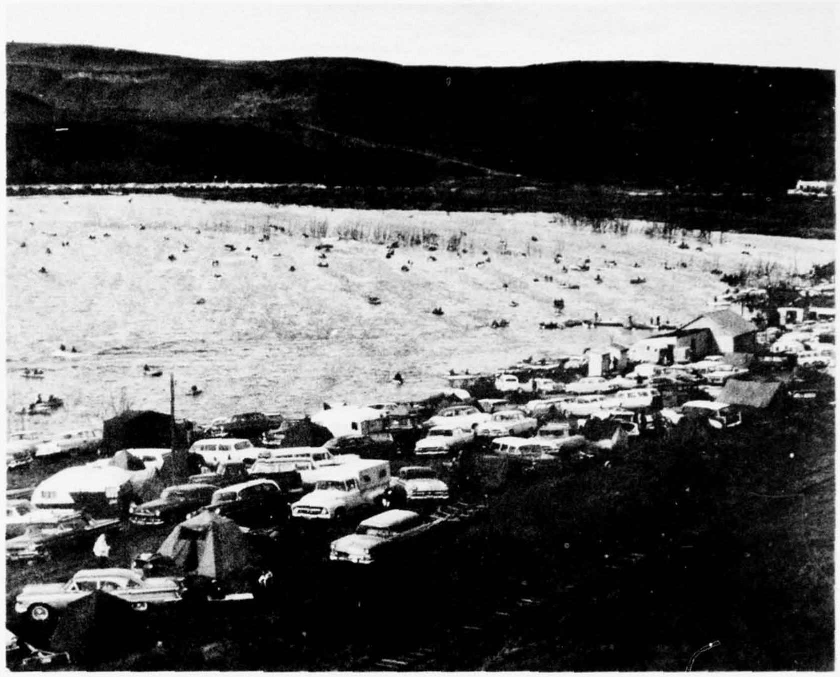
Approximately 2,704,000 angler-days are expended annually for resident fish. An analysis of this use is shown in table 20.

Table 20 - Estimated Sport Fishing Use of Resident Fish, Subregion 2, 1965 1/

Waters	Angler-Days
Streams	568,000
Lakes, Ponds, and Reservoirs	2,136,000
Total	2,704,000

1/ Estimates based on Washington Department of Game data.

This subregion is within easy driving distance of all major metropolitan areas in the State and is a popular vacation area for residents of other States. Anglers that use subregion waters are from all parts of Washington and the Nation.



Waters of the subregion attract anglers from all parts of Washington and the Nation. (Washington Department of Game)

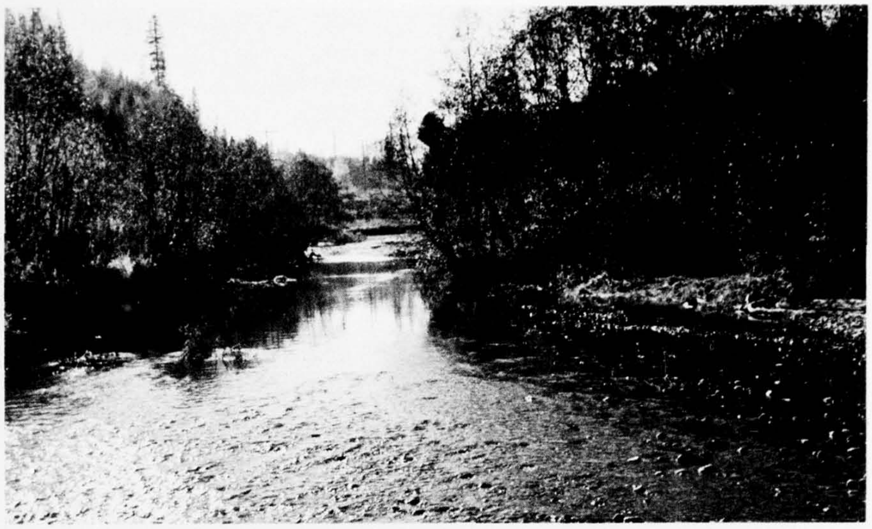
Expenditures for fishing tackle, travel, lodging, licenses, and services are of considerable economic importance to the subregion. Such expenditures amounted to about $13,500,000 in 1965.

Sport fishing for resident salmonids exceeds natural production in most accessible waters. Less accessible waters usually have native fish populations, but generally not in numbers capable of supporting a significant increase in fishing effort.

Warmwater game fish are generally underharvested and could support a significantly increased use. Nongame fish such as carp, squawfish, and lamprey could possibly withstand commercial exploitation as food fish or industrial fish. However, present prices and demand for such fish are too low to allow profitable enterprises to develop. How high the sustained yield would be if harvesting on a large scale were practical is not known.

Factors Affecting Resource

In most cases, large reservoirs fluctuate through normal operation and do not provide suitable habitat for game fish. Large reservoirs are inherently difficult to manage, and nongame fish,



A winding natural stream with riffles, pools, and streambank cover provides aquatic habitat and a place to fish. (John Reid, Spokesman-Review, Spokane, Washington)

Ditch-like channeling removes riffle-pool pattern, bankholding vegetation, and offends the eye. (John Reid, Spokesman-Review, Spokane, Washington)

due to less restrictive requirements, thrive in such waters making management even more difficult. Municipal and agricultural pollution is becoming serious as development continues. Use of herbicides and pesticides as yet is locally detrimental; however, continued unrestricted use could cause serious problems.

The Columbia Basin Project created many good fishing waters from formerly dry desertlands. Through fishery management agencies' efforts, stocks of game fish have been established in these waters. However, the habitat is also suitable for nongame fish and periodic chemical rehabilitation is required to control such fish. There are seven trout hatcheries in the subregion.

Big Game

Big game species include deer, elk, black bear, mountain lion, and mountain goat. Extensive general hunting seasons are permitted annually on all of these species except mountain goat. A special hunt is allowed on a drawing basis for this highly valued trophy animal. Other special hunts include those for removal of depredating animals, bow and arrow seasons, early high mountain seasons, and either-sex deer and elk seasons.

Habitat

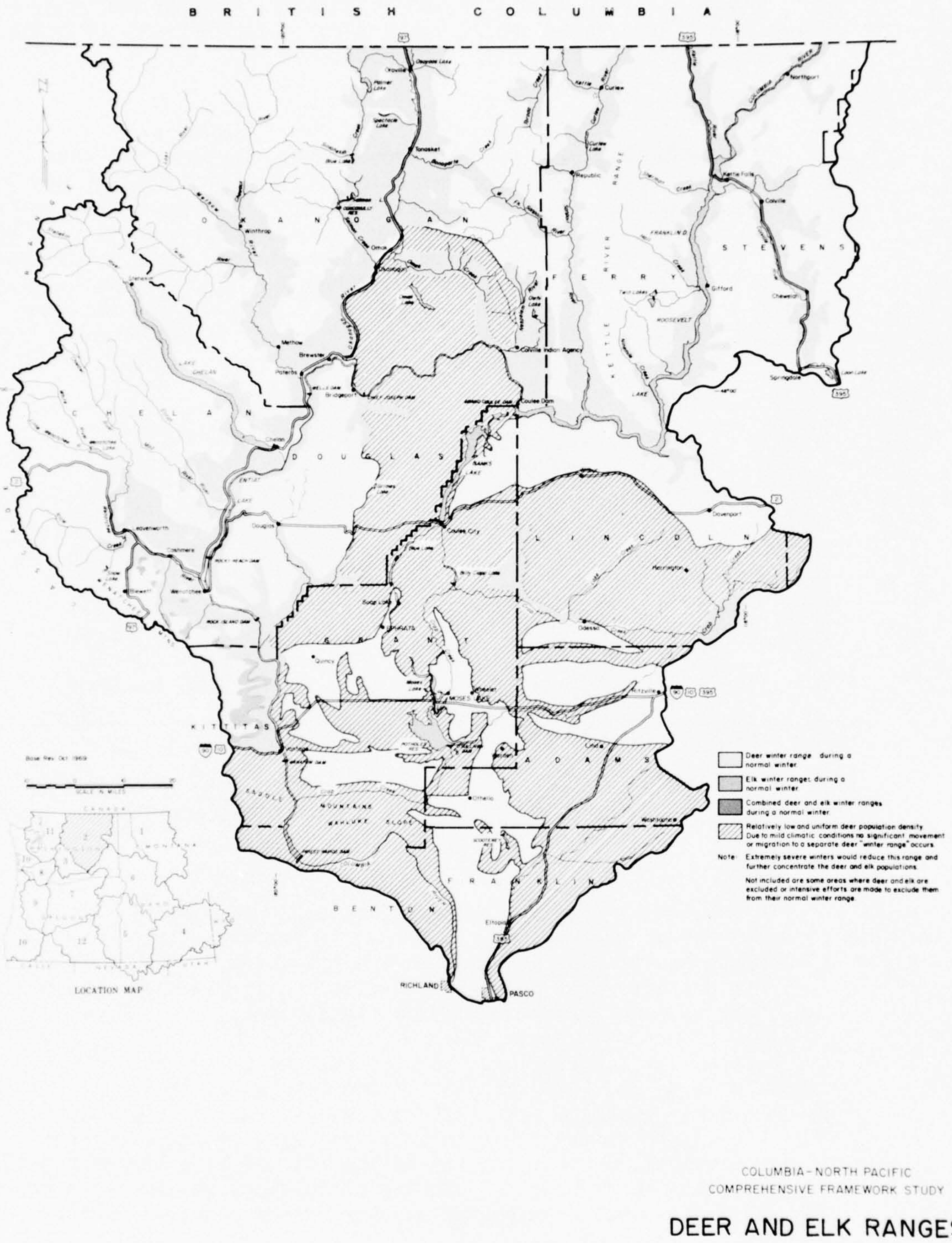
Rougher parts of the subregion, notably along eastern foothills of the Cascade Range and throughout the Okanogan Highland foothills provide summer and winter range.

During winter months deer and elk ranges are reduced to a fraction of summer range, and are largely centered on and around bottomlands. The degree of reduction bears a direct relationship to the severity and duration of any given winter.

The key winter range map, figure 9, indicates deer and elk ranges used during normal winters. These areas are characterized by relatively dense deer concentrations during winter months. Areas where significant deer populations exist but density is relatively low and uniform are also shown. On these areas no noticeable migration to winter range takes place. No attempt was made to designate density within these two winter range categories. However, there are distinct variations in density.

Some other areas, not specifically shown, fall within natural winter range limits, but attempts are made to exclude big game from these areas because they damage agricultural crops.

Black bear occur throughout the subregion, except for treeless areas of the Columbia Lava Province.



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

DEER AND ELK RANGES

UPPER COLUMBIA SUBREGION 2

1970

FIGURE 9

Mountain lion require large relatively isolated ranges. Physical habitat requirements, other than isolation, are about the same as for deer, their basic food source.

Use

In 1965, big game species provided an estimated 406,000 hunter-days. Consistent with existing management technology and hunter ability, big game species are currently harvested near their maximum potential to maintain healthy herds through natural reproduction. Although many animals live in remote inaccessible areas, they generally migrate to more accessible areas during winter months. With few exceptions, this makes intensive management and maximum harvests possible. An analysis of hunting use for the various species is shown in table 21.

Table 21 - Estimated Hunting Use of Big Game, Subregion 2, 1965 1/

Species	Hunter-Days
Deer	355,837
Elk	42,731
Black Bear	6,093
Mountain Goat	1,335
Total	405,996

1/ Based on State of Washington Game Harvest data.

The 1965 expenditures for big game hunting were about $3,900,000. This is an indication of the importance of the resource.

Some additional big game hunting might be realized on the Colville Indian Reservation, U. S. Army's Yakima Firing Center, and the Atomic Energy Commission's Hanford Reservation. There is no reliable estimate of additional hunter-days those areas could provide, but in some cases it would be significant.

Since no accurate estimates of harvest by Indians on the 1,053,200-acre Colville reservation are available, it is not possible to accurately estimate what influence public control might have. Some opportunities may exist to increase big game numbers, especially antelope, on that portion of the 261,199-acre Yakima Firing Center within the subregion. Safety precautions on live-fire ranges and dud areas preclude entry by management personnel or hunters.

In addition, big game harassment during military exercises may limit the area's present production potential. At the present time, safety and security preclude hunting and fishing in the 348,000-acre Atomic Energy Commission reservation near Richland, Washington. Provision of hunting and fishing access to this area could be an important consideration in the future.

Factors Affecting Resource

Big game herds are limited principally by winter range deficiency over much of Subregion 2. Forest clearing and agricultural lands produce ample summer range for both browsing and grazing species. About 1936, major water development projects began to inundate bottomlands, the only winter range these animals have. Flooding thousands of acres of winter range in recent years, coupled with agricultural exclusion of big game, has severely limited some herds.

Habitat improvement programs by wildlife management interests have provided some additional habitat. Such programs include browse plantings and controlled burns, and are designed to stabilize or increase the big game carrying capacity on these areas.

Upland Game

Upland game species include ring-necked pheasant, chukar, Hungarian partridge, bobwhite, valley quail, ptarmigan, ruffed grouse, blue grouse, spruce grouse, sharp-tailed grouse, sage grouse, Wilson's snipe, band-tailed pigeon, mourning dove, and rabbit. Ring-necked pheasant, Hungarian partridge, chukar, and quail are introduced species. They provide a large percentage of the annual statewide upland game bird harvest. Other exotics have been experimentally introduced, but none have been very successful. Liberal hunting seasons designed to harvest all production beyond that necessary to sustain optimum populations are allowed on all species except ptarmigan. Even hen pheasant have been hunted in areas where their populations indicated an excess breeding potential.

Habitat

Nearly one-third of Subregion 2 consists of irrigated lands where agriculture and brushlands occur together. These agricultural lands meet most upland game habitat demands, particularly for pheasant, quail, dove, and rabbit. Many small tributaries feeding the Columbia River furnish bottomland brush habitat where quail and ruffed grouse concentrate. In higher elevations of these drainages blue and spruce grouse thrive in the coniferous forests.

Although severely reduced by extensive sagebrush clearing, sage grouse still exist where suitable habitat is found. Only

remnant populations of Columbian sharp-tailed grouse remain. Their existence is seriously threatened throughout Subregion 2. Irrigation projects and woody vegetation clearing have eliminated the bunchgrass/woodlot habitat, a strict requirement of this species. Without special considerations this bird will soon be eliminated from the Upper Columbia Subregion.

Still different habitat types are occupied by chukar and Hungarian partridge. The latter prefers rolling, arid, sagebrush-bunchgrass areas associated with dry farming. They can adapt their food habits to accept the most readily available supply. On the other hand, chukar display a decided preference for cheatgrass as a food supply. They thrive in semiarid mountain ranges broken by steep, rugged canyons covered by cheatgrass, sagebrush, bunchgrass, and rocky outcroppings.

Mourning dove are found in any habitat close to small grains (domestic or wild) and water, but they have displayed a decided nesting preference for orchards. Mature, well pruned, standard size apple orchards have shown production of nearly 30 birds per acre annually. Unfortunately, dwarf variety apple trees are better suited to modern, mechanized orchard culture and the more vertical configuration of these varieties is much less attractive to doves. More and more dwarf trees are replacing standard sizes and dove production in orchards is declining.

Cottontail[1/] are generally found in the same habitat required by pheasant and quail, agricultural lands with brushy thickets nearby. The snowshoe rabbit is more closely associated with brushy areas in coniferous forests of the Okanogan Highlands and the eastern slope of the Cascade Range. Black-tailed and white-tailed jack rabbit are generally distributed throughout arid sagebrush and bunchgrass areas. The pigmy rabbit occurs rarely in the sagebrush areas.

Ptarmigan, Wilson's snipe, and band-tailed pigeon habitats are not extensive in the subregion.

Use

During 1965, the subregion's upland game provided an estimated 659,000 hunter-days. This use represents approximately 40 percent of the statewide harvest of pheasant and dove; 30 percent of the statewide harvest of grouse, quail, chukar, and Hungarian partridge; and 55 percent of the statewide harvest of sage grouse. These

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1/ Includes native Nuttall cottontail and introduced Florida cottontail.

approximations are included to indicate statewide importance of maintaining adequate game bird habitat in this subregion. Table 22 shows hunter use for the various species.

Table 22 - Estimated Hunting Use of Upland Game, Subregion 2, 1965 1/

Species	Hunter-Days
Pheasant	347,621
Grouse 2/	138,605
Quail	55,706
Mourning Dove	40,103
Chukar	38,098
Rabbit	23,241
Hungarian Partridge	8,972
Wilson's Snipe	4,516
Sage Grouse	1,766
Band-tailed Pigeon	544
Total	659,172

1/ Based on State of Washington Game Harvest Data.
2/ Includes ruffed, blue, and spruce grouse.

Hunters spent about $3,200,000 in pursuit of upland game during 1965.

Generally, maximum numbers of the accessible upland game birds are harvested. Remote areas often contain underharvested forest grouse populations, but continued logging road development is rapidly making these game bird reserves available.

Most rabbit are bagged incidental to hunting of other species. However, in the future, rabbit may become as important here as they are in eastern United States today.

As with big game, increased upland game bird harvests may result when, and if, the public is permitted to hunt on the Colville Indian Reservation, Atomic Energy Commission's Hanford Reservation, and U. S. Army's Yakima Firing Center.

Factors Affecting Resource

While elimination of their natural habitat has often reduced or eliminated grouse from their original range, exotics have thrived in some of the created environments. Irrigation projects, notably the Columbia Basin Project, have eliminated extensive bunchgrass and

sagebrush habitats with a corresponding reduction in sharp-tailed grouse and sage grouse numbers. However, these native species have been replaced by such introduced species as pheasant and quail.

Only recently have the subregion's "clean" farming practices begun to significantly reduce exotic birds on irrigated lands. Such practices as elimination of fence rows that served as cover during inclement winter weather, and habitual and excessive use of pesticides, have seriously reduced or eliminated some bird populations. If present day agricultural trends continue, incidental wildlife resource benefits derived from irrigation projects will be greatly reduced and many will be completely eliminated.

Fur Animals

Beaver, muskrat, mink, and raccoon are generally in abundant supply. Less common are marten, fisher, river otter, striped skunk, spotted skunk, weasel, bobcat, lynx, coyote, red fox, opossum, badger, and wolverine. Population density is often directly related to trapping pressure, or to cyclic trends in the prey upon which the fur animals depend for a food supply.

Habitat

Habitat requirements for furbearers are extremely varied. Beaver, muskrat, mink, raccoon, and otter require aquatic habitats. Martin, fisher, lynx, and wolverine require higher elevation coniferous forest. Bobcat, badger, spotted skunk, and coyote are often associated with lands along the desert-forest fringes. Other fur-bearing species are generally associated with valleys and bottomlands. Some species such as weasel and skunk may often be found in urban areas.

Use

During the 1964-65 trapping season approximately 13,000 pelts were taken. These included 9,700 muskrat, 1,800 beaver, 700 mink, 300 raccoon, and smaller numbers of at least eight other species.

Fur animal harvest is directly related to fur prices and low harvests do not always reflect low animal densities. When fur prices do not justify trapper effort, harvest figures decline. Although most individuals trap for recreation or on a part-time basis, there is a point of diminishing returns beyond which they will not expend additional trapping effort. The market value for furs taken during the 1964-65 season was about $50,000.

Factors Affecting Resource

Water development generally has a detrimental effect on aquatic fur animals by inundating and destroying their flood plain habitat while creating a much reduced and inferior shoreline habitat. Certain exceptions do occur. Muskrat and beaver often adapt to reservoirs and ditches as substitutes for natural water bodies. Unfortunately, their habit of digging dens in levees and dikes usually meets with landowner disapproval. Consequently, every effort is generally made to exclude them from development project lands.

Mink, raccoon, and otter are largely dependent on fish and fresh-water invertebrates for their diet. Mudflats along reservoirs do not produce small aquatic vertebrates in quantities comparable to those found in streams. In addition, reservoirs do not provide the opportunity found along streams for catching these prey organisms. The full impact of reservoirs on fur animal food supplies is not known. Reservoirs can eliminate some species locally.

Marten, fisher, and lynx are seldom significantly influenced by water development. However, any encroachment into wilderness habitat does reduce their numbers.

Waterfowl

The Upper Columbia Subregion is one of the more important waterfowl areas in the United States. As a preferred migration stopover and wintering area, the *Columbia Basin Project* is probably equal to any area in the Pacific Flyway. Only a slight production increase can be categorically attributed to this development, but utilization by nonresident waterfowl has unquestionably been phenomenal. From 1952 to 1961, duck use on several selected water bodies increased from 56,250 to 306,800 or about 445 percent. This estimate is fairly representative of waterfowl use noted throughout all irrigated portions of the upper Columbia during this same period.

Most waterfowl species of the Pacific Flyway are found in Subregion 2. These include mallard, gadwall, American widgeon, green-winged teal, blue-winged teal, cinnamon teal, shoveler, pintail, redhead, canvasback, scaup, ring-necked duck, goldeneye, bufflehead, ruddy duck, coot, Canada goose, and whistling swan. Other species have been recorded.

Habitat

Subregion 2 has over 450 square miles of surface water and most of it is used extensively by ducks and geese for nesting,

feeding, or resting. Values attached to this area by waterfowl management agencies are exemplified by extensive landholdings devoted primarily to waterfowl management. Figure 8 shows ten State-operated waterfowl areas totaling about 138,500 acres and one 29,600-acre national wildlife refuge devoted primarily to waterfowl protection and propagation. In addition, a few private landowners are practicing management specifically for waterfowl and many sportsmen are buying lands to manage for waterfowl production and private shooting preserves.

Vast acreages of corn and other grains close to wetlands provide preferred foods for dabbling ducks. Diving ducks find ample organisms and aquatic vegetation to satisfy their demands in reservoirs, canals, and other waterways of the Columbia Basin Project.

Use

Approximately 276,000 hunter-days were expended hunting ducks and geese during 1965. An analysis of this use is shown in table 23.

Table 23 - Estimated Hunting Use of Waterfowl, Subregion 2, 1965 1/

Species	Hunter-Days
Ducks	260,054
Geese	15,523
Total	275,577

1/ Based on State of Washington Game Harvest Data.

Waterfowl kills represent approximately 25 percent of the statewide duck harvest and 35 percent of the statewide goose harvest. Hunters spent about $1,800,000 hunting waterfowl in 1965.

Public access is currently restricted on the Atomic Energy Commission's Hanford Reservation where some increased harvest might be possible if additional lands were opened to hunting. However, most waterfowl utilizing this reservation are probably available to hunters in nearby State-operated shooting grounds. Potentials for increasing harvests or production on the Colville Indian Reservation without extensive habitat manipulations are highly problematical. Extent of Indian waterfowl hunting efforts are not well documented, but they do harvest numerous ducks and geese.

Factors Affecting Resource

Feeding and resting site contributions to the waterfowl program from irrigation projects are obvious. With their "open water" storage, canals, wasteways, and food supplies they are extremely important. Many ducks and geese found in Subregion 2 today may have been "pulled" or relocated from other historical migration routes by such features. There is some evidence that the phenomenal increases noted in the Columbia Basin may have been offset somewhat by declines elsewhere.

Creation of nesting habitat does not necessarily accompany irrigation project construction. The very nature of irrigation as a water use results in reservoir, canal, and wasteway water level fluctuations that exceed those normally found in natural water bodies. These fluctuations alternately "flood out" nests, leave them "high and dry" exposing them to extensive predation dangers, and retard shallow water aquatic food plant growth. Acceptable tolerances in water level fluctuation in waterfowl nesting areas are not fully understood, but such fluctuations have generally proved extremely detrimental.

Other Wildlife

Many other wildlife species make up the remainder of the upper Columbia fauna. These species generally fall into one of the following categories: songbirds, shorebirds, birds of prey, small mammals (including "predators" or "varmints"), amphibians, and reptiles. Many species are included in more than one category. Several furbearers are often classed as predators, some "varmints" are also birds or small mammals, and some so-called predators are also classed as big game. For example, bobcat and coyote are considered furbearer or predator, while mountain lion and bear are classified as both predator and big game.

Habitat

All habitat niches found in the subregion are occupied by one or more of these "other wildlife" species. Consequently, loss of any habitat has its accompanying wildlife loss.

Use

Approximately 28,000 hunter-days were expended in 1965 hunting various species within the "other wildlife" group. Although additional man-days use in such specialized hunting as "predator calling" (coyote, crow, bobcat) and "varminting" (woodchuck, ground squirrel) are anticipated, the extent of this use cannot be estimated. These recreational sources are currently in their infancy in Subregion 2, and quantitative use and harvest data are not available.

All habitat niches in the subregion are occupied by one or more wildlife species. (Washington Department of Game)

Factors Affecting Resource

As with all other species discussed previously, loss of habitat whether due to water development, urban development, or other disturbance means loss of carrying capacity. Moreover, some agricultural and livestock interests tend to support unrealistic and antiquated predator and rodent control measures that severely reduce many species.

Uncontrolled and misguided use of insecticides on trees, lawns, and gardens has eliminated all but the most resistant songbirds from many urban neighborhoods. These losses generally cause an increase in insects ordinarily controlled by the eliminated birds resulting in the need for more and heavier chemical applications.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

Free flowing reaches of at least eight streams should be preserved and protected against any alteration or development detrimental to the fishery. Fish habitat improvement measures should consist mainly of pollution control and improved streamflow. Further studies are necessary to provide details. Fish passage facilities should be provided or improved at various barriers on five streams. Increased access should be acquired to lakes and streams to permit a greater harvest. Facilities for the artificial propagation of fish should be developed when needs justify them.

Habitat preservation for wildlife should include setting aside areas of high quality habitat and special habitat areas for upland game and waterfowl. All remaining big game winter range also should be preserved. The sum of these areas comprises about a million acres. Habitat improvement should include extensive and continuing land treatment practices in connection with irrigation projects to provide and maintain food, water, cover, and living space for upland game and waterfowl. Grain harvesting should be manipulated, and reservoir water levels should be stabilized to improve waterfowl habitat. Existing big game winter range should be upgraded by special ecological manipulations, certain timber management practices, browse "farming," zoning for big game, control of livestock grazing, and mechanical devices. Further studies are necessary to determine where additional harvests can be taken and what measures are needed to implement greater harvest. By 2020 approximately 57,000 pheasant will need to be stocked annually. Stocking waterfowl and artificial feeding of upland game and waterfowl may be useful measures, also. Winter feeding programs for big game should be continued and the artificial propagation of big game may be considered after 2020.

Fishing

The Upper Columbia Subregion will have an increased demand of about 3.8 million angler-days for resident fish by year 2020. In addition, a portion of the regional anadromous fish needs for sport and commercial fishing will have to be satisfied here. The subregion has the potential for satisfying these needs if proper long-range plans are developed and integrated with other water uses.

Existing and planned programs are expected to conserve and increase fish resources in the Upper Columbia Subregion. However, development of a fish and wildlife plan integrated with other water uses is necessary to satisfy future needs.

Habitat Preservation

Remaining free-flowing streams are of high quality and have the potential to satisfy stream fishing through 2020, provided the natural streams are preserved and enhanced for fish.

The major rivers which have the greatest potential for satisfying future needs are listed below. The remaining natural reaches of these should be preserved.

- Methow River - all
- West Fork Methow River - all
- Twisp River - all
- Wenatchee River, from Wenatchee Lake to town of Leavenworth
- Little Wenatchee River, from origin to Wenatchee Lake
- White River, from Glacier Peak Wilderness to Wenatchee Lake
- Columbia River, from Priest Rapids Dam to Wallula Lake

Habitat Improvement

Habitat improvement would consist primarily of pollution control. Irrigation returns which carry heated water, silt, pesticides, and fertilizers cause water quality problems in some areas and could become more serious as more land is irrigated. Municipal and industrial pollution will need to be controlled effectively, although it is not presently a widespread problem. In the future, it could seriously affect fish habitat if the proper precautions are not taken. More detailed studies of the pollution problem and abatement methods need to be conducted.

Low streamflows are characteristic in the subregion due to the natural arid summer climate of the area and, in some reaches, to irrigation withdrawals. If suitable flows for fish could be established during critical seasons, benefits to fish could be realized. Additional studies will need to be made to identify problem streams and to determine the suitable flows required and benefits which would accrue.

Available data show that Okanogan River has critical low flows and high water temperatures during August, September, and October. With upstream storage, this problem could be solved. Other periods are characterized by low flows, but the above months are critical to migrating fish.

Nongame fish are a problem in subregion waters. Selective toxicants show promise for future control of these species.

Streams listed below have suitable spawning or rearing habitat in their upper reaches that are blocked to anadromous salmonids by the barriers indicated:

Wenatchee River (Dryden Dam, Leavenworth Dam, and Tumwater Dam)
Wenatchee River (30-foot falls, river mile 15)
Little Wenatchee River (25-foot falls, river mile 6)
White River (falls, river mile 13)
Okanogan River (Vawpolx Dam, Canada)
Similkameen River (Enloes Dam)

Means to improve or promote access over the barriers should be completed by 1980. Estimated cost for completion of these passage facilities is about two million dollars. Benefits would be primarily for regional commercial and sport fisheries for anadromous fish.

Upstream and downstream fish passage at Chief Joseph and Grand Coulee Dams is presently infeasible because of technical and economic problems; however, future research may suggest feasible means to achieve passage. In such an event, fish-passage facilities should be constructed between 1981 and 2000.

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 24.

Greater Harvest

There is little opportunity for increasing the harvest of existing anadromous fish populations. Most of these stocks are presently being used to capacity. Steelhead migrating through mainstem reservoirs are largely unharvested.

Resident trout populations are largely dependent upon artificial propagation, and harvest is keyed directly to the number and size of fish stocked. Opportunities to increase utilization of the resource exist in the form of increased access; however, this would also require increased stocking. State fishery agencies' programs of lake and stream access acquisition include about 600 miles of riverbank and 950 miles on smaller creeks which are all exterior to federally-owned or -controlled properties. About 56 lakes, which total over 15,000 surface acres, are included in the program. Some of the lakes and streams have access areas, but there is a need to modify or enlarge them to accommodate future needs. Pedestrian easements, boat launching sites, and parking areas along desirable portions of the lakes and streams would cost an estimated $200,000 annually for progressive development with an estimated annual operation and maintenance equaling 10 percent of the annual

Table 24 - Fish Habitat Improvement Means, Subregion 2

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Stream improvement	mile	80	156	110	214	100	194
Stream channel preparation	mile	1	20	1	20	1	20
Lake improvement	acre	130	108	180	150	140	118
Sub-totals			284		384		332
Planning							
Fish stream surveys	mile	1,570	48	Not available		Not available	
Fish lake surveys	acre	7,670	60	Not available		Not available	
Sub-total			108				
Total			392				

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement							
Stream	mile	34)	8,978	27)	4,274	50)	7,498
Lake	acre	19,200)		9,130)		13,889)	
Fish lakes	acre	1,400	2,000	1,000	1,500	700	1,000
Totals			10,978		5,774		8,498

capital cost investment. Access development should be completed between 1980 and 2000.

Warmwater fish populations have a capacity for significant increased use. Access provided for resident trout angling will also benefit the warmwater fishery where both groups are found. Future needs for warmwater fish will be satisfied through year 2020 provided the present management level continues.

Augmentation of Supply

Future anadromous fish populations will increasingly depend upon hatcheries and other means of artificial production.

Increased production in existing hatcheries can be accomplished through water reuse, controlled environment, improved feeds, disease abatement, and many other techniques. However, construction of new hatcheries or enlargement of existing ones within the subregion will be necessary to meet future needs.

No new hatchery sites are listed for this subregion. When needs justify additional hatchery facilities, more detailed studies will be needed to determine where such facilities could be constructed.

Existing ponds or small impoundments suitable for rearing anadromous fish should be identified and reserved for this purpose. Locations of construction sites for small impoundments should be identified by 1980. Possible areas for rearing salmon and steelhead smolts are: the lower Crab Creek area; Priest Rapids area; Quincy Wildlife-Recreation Area; and areas along the Methow and Wenatchee River systems.

Lagoons and lakes adjacent to large reservoirs should be evaluated for rearing trout fry to legal size for release into the reservoirs. Suitable streams tributary to large lakes and reservoirs can also be utilized as spawning channels for adults, hatching channels for eyed-egg plants, and/or incubation.

With increased irrigation of the Columbia Basin Project, areas along the Columbia and Snake Rivers similar to Ringold Springs may develop. If such areas appear, they should be reserved and developed for fish production.

Hunting

Excellent opportunities to increase upland game and waterfowl production exist in Subregion 2. If adequately provided for in on-going or proposed irrigation project plans, game bird populations can probably be increased or at least maintained at their present relatively high levels.

However, game birds are not necessarily perpetual byproducts of irrigation; special, often costly, provisions must be incorporated in authorizing legislation to realize these benefits.

Opportunities to produce big game are mostly limited to existing key winter ranges. This is especially true in mountainous areas such as parts of Subregion 2, where game herds are forced to survive on restricted low elevation ranges during severe winter months. Unfortunately, these confined ranges are generally lands that most readily lend themselves to development of recreational areas, cropland, highways, railroads, and urban housing, or they are the flood plains inundated by reservoirs. Advanced technology in habitat manipulation will help, but it cannot cope with anticipated losses as indicated by past trends in habitat destruction. To retain the economic benefits associated with big game resources, selected areas must be preserved, and all habitat with additional potential must be upgraded to the maximum possible.

By 2020, Subregion 2 will have an increased demand, or need, for about 1.6 million hunter-days. In addition, it must also retain furbearer and other nonhunted wildlife forms because nonhunting man-days will probably exceed hunting uses.

Habitat Preservation

Several upland game species such as the Columbian sharptail (an endangered species) and sage grouse do not readily adapt to changing environments. To retain these species it will be necessary to set aside sections of high quality habitat that fulfill their extremely restricted environmental requirements. Sharp-tailed and sage grouse strutting grounds have been identified in Lincoln and Grant Counties. However, other important areas undoubtedly exist and detailed studies are needed to determine exactly which sites should be preserved to best fulfill the needs of these birds.

Numerous upland game and waterfowl areas are being studied in conjunction with ongoing or proposed irrigation projects in Subregion 2. The units being considered, in the vicinity of the Columbia Basin Project, including the area to be served by East High Canal, are those listed below:

Eagle or Scooteney Lake	24,710 acres
Sulphur Reservoir	12,540 acres
Lower Crab Creek	16,720 acres
Black Rock Lakes	6,600 acres
Owl Lake	15,320 acres
WB 10 Wasteway	4,440 acres

Project wasteway and project drains (all)	2,600 miles[1/]
Smith Canyon	28,000 acres
Esquatzel Coulee	unknown
Wahluke Slope Lakes (two)	unknown
McChesney Springs	unknown

These areas should be acquired and set aside primarily for the development of upland game, waterfowl, and fish resources. Detailed studies will be required to refine estimates of benefits and land and water requirements.

Equally significant opportunities to enhance or maintain game bird populations will be identified throughout the nearly 2.5 million acres classified as "potentially irrigable" in the vicinity of the Columbia Basin Project.

Preservation of big game winter range is paramount in planning for a future in big game hunting. Natural winter ranges must be defined and set aside primarily for the use of big game herds. Loss of any of the shaded key winter range area (figure 9, "Present Status") will ultimately and permanently reduce game populations over a much larger area.

Generally, bottomland and foothill habitat below 3,000 feet elevation throughout the Okanogan Highland Province and along the eastern slope of the Cascade Range constitutes present and historical winter ranges. In Subregion 2, approximately 800,000 acres are in this category. Washington Department of Game owns or controls and manages about 80,000 acres of these key winter ranges. The U.S.D.A. Forest Service exercises varying degrees of control for habitat management on an additional 20,000 acres. The remaining 700,000 acres are generally owned by individuals or agencies not necessarily oriented toward big game production. In fact, winter use of such acreages by big game herds often competes directly with the owners' intended land use. These 700,000 acres offer the only significant opportunity to enlarge big game populations or to offset losses from water development projects.

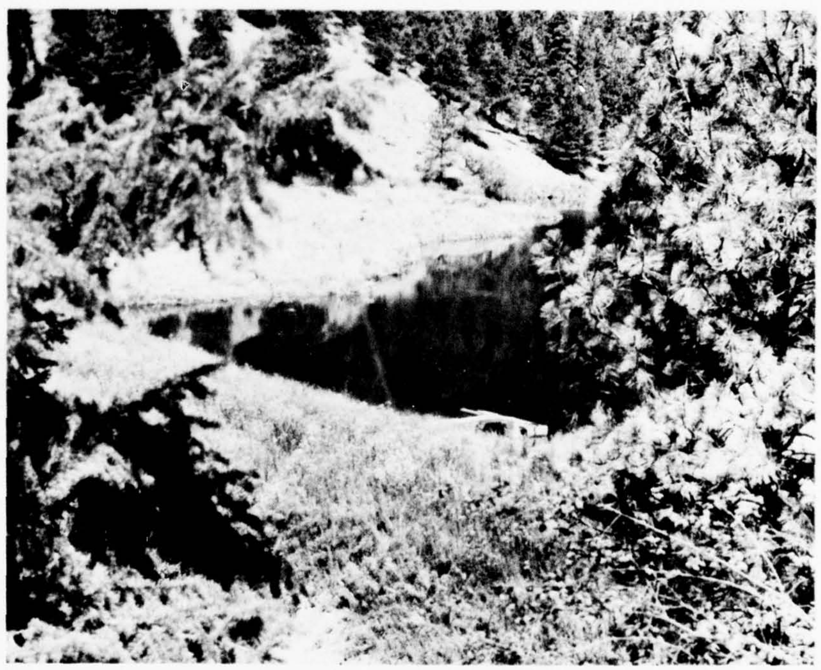
Retention of other wildlife forms will sometimes require that areas be set aside as sanctuaries. Furbearers will generally benefit from measures taken to preserve waterfowl and big game habitat. Some nongame species will benefit from preservation of any natural habitat, but other areas will undoubtedly be required specifically for their use, especially in and around urban centers. Further studies will be required to identify such areas.

1/ Management of habitat belts varying from 300-500 feet in width.

Costs associated with habitat preservation for all wildlife forms must basically be equated to reduced production of other potential competitive land uses. Where land acquisition is anticipated, the value of prime agricultural lands in the vicinity will serve as guidelines for computing game range or refuge costs. Additional studies will develop more definitive cost estimates for needed land acquisition or perpetual lease.

Habitat Improvement

There are opportunities to enhance upland game and waterfowl habitat through land treatment measures, and measures undertaken for one group will often benefit the other. Assuming that more arable lands in the Columbia Basin Project will be brought under irrigation and one or more new projects undertaken, Subregion 2 will produce upland game birds through 2020. A more detailed discussion of means to retain upland game at future irrigation projects; provide food, water, and cover for waterfowl; and improve big game ranges through ecosystem manipulations, proper timber management, browse "farming," zoning, controlled livestock grazing, and mechanical devices can be found in "Regional Summary," "Means to Satisfy Needs."



Small headwater impoundments can improve habitat. (Washington Department of Game)

In addition to the general enhancement opportunities discussed in the "Regional Summary," several specific considerations should be noted. For example, needs for additional large water bodies for waterfowl resting and feeding are not anticipated during this study period in Subregion 2. It is also anticipated that existing large open water bodies will provide adult waterfowl with adequate protection from natural predators and hunters through 2020. In big game management attempting to produce through habitat improvement a significant portion of the additional animals needed annually is probably an insurmountable task, based on current browse production technology. However, some fencing is required. Based on current trends, Washington Department of Game estimates a need for fencing of at least 325 miles in 1980; 425 miles in 2000, and 550 miles in 2020.

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are included in table 25.

Greater Harvest

All forest grouse and a few isolated big game herds have the reproductive capability to stand greater harvests. However, the extent of this potential is not known. Further studies may identify where additional harvests can safely be undertaken and develop methods to encourage such harvests.

Where underharvested game populations exist, accessibility is generally poor and hunter returns per unit of effort exceptionally low. These low returns can be attributed to widespread game populations, terrain that is difficult to hunt, dense vegetative cover, or a combination of these influences. Access can be provided, but hunters must arbitrarily elect to spend more time per game animal harvested if "greater harvest" is to prove significant as a means to satisfy future needs. For most species, the present return per unit of effort appears to be a realistic barrier to increased harvests.

Augmentation of Supply

Stocking game farm birds is an integral part of the Upper Columbia Subregion's upland game management program. Approximately 27,000 pheasant are released as brood stock and/or for the hunter's gun, annually. Other upland game species, such as Hungarian partridge and chukar, are also raised for brood stock. Although introductions of new exotics and reintroduction of native species will undoubtedly be attempted, there is no reason to believe that such introductions will contribute significantly to hunting needs during this study period. However, game farms will become increasingly important in satisfying upland game needs as hunting pressure on natural game populations increases. Based on current use trends involving "farmed" pheasant, Subregion 2 will require 33,000 birds by 1980,

Table 25 - Wildlife Habitat Improvement Means, Subregion 2

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Seeding and planting	acre	3,000	246.0	4,000	330	4,000	330
Forage release & prescribed burning	acre	700	13.0	800	15	800	15
Key area fencing	mile	30	30.0	30	30	20	20
Permanent openings	acre	1,600	160.0	2,070	207	2,070	207
Wildlife food crops	acre	4,700	29.6	5,400	34	5,400	34
Guzzlers	each	20	20.0	30	30	20	20
Shallow impoundments and marsh improvement	acre	50	34.0	80	53	70	49
Develop plantings	acre	60	6.0	70	7	70	7
Develop potholes	each	10	5.0	--	--	--	--
Develop nesting facilities	each	10	1.0	10	1	--	--
Sub-totals			544.6		707		662
Planning							
Big game range analysis	acre	795,600	80.0	Not available		Not available	
Upland game habitat surveys	acre	1,700,000	68.0	Not available		Not available	
Habitat management plans	each	71	35.0	Not available		Not available	
Sub-total			183.0				
Total			727.6				

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement 1/	acre	650,000	313	774,000	463	962,000	689
Land acquisition 2/	acre	260,000	15,541	124,000	7,355	188,000	11,183
Fencing 3/	mile	345	119	38	57	57	86
Water developments 4/	each	360	22	177	11	258	16
Totals			15,995		7,886		11,974

1/ Includes cover plots, food patches, fencing, marsh development, potholes, nest structures, etc., not identified specifically in the table.
2/ Obtained by fee purchase and easement rights.
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land.
4/ Consists primarily of guzzler installations and spring development (including fencing) by agreement on private land (can include nest structures in other subregions).

44,000 by 2000, and 57,000 by 2020. Capital outlay for pheasant hatchery and rearing facilities are approximately $255,000 per 10,000 birds capacity. Annual operation, maintenance, and replacement costs are currently $3 per bird.

Big game feeding programs are expensive. In Subregion 2 during the 1968-69 winter, Washington Department of Game fed 84 tons of specially prepared pelletized deer food at $68 per ton and 243 tons of hay at $33 per ton. Labor and equipment costs added an additional $4,000. Consequently, this once in 5- or 6-year program will cost approximately $25,000 or $50,000 annually. Side benefits from feeding programs, where feasible, include: (1) a lessening of population fluctuations in normal population dynamics, (2) possible reduction in competition for browse between elk and deer where their ranges overlap, and (3) public acceptance of annual and sustained either-sex harvest seasons, normally lost for several years following a decimating winter.

LOCATION MAP

SUBREGION 3

SUBREGION 3, YAKIMA

GENERAL DESCRIPTION OF SUBREGION

The Yakima Subregion consists of over 6,000 square miles drained by the Yakima River and its tributaries. As the Yakima flows toward its confluence with the Columbia River, it is fed by eleven major tributaries and several smaller tributaries. The Yakima has an annual average discharge of approximately 3,000 cfs. Its natural streamflow is characterized by high waters during winter and spring months and lower flows during summer months. These natural flows are influenced by several storage reservoirs, hydroelectric development, ground water withdrawals, diversions for irrigation, and return flows from irrigated lands.

The subregion is roughly 60 miles wide, 100 miles long, and encompasses nearly 4,000,000 acres. It is bordered on the west by the Cascades, on the north by the Wenatchee Mountains, on the east by the Columbia River drainage, and on the south by Horse Heaven Hills.

Bottomlands along this northwest-southeast oriented river are primarily used for agriculture. Extensive irrigation helps produce diversified crops such as livestock forage, sugar beets, hops, mint. grain, corn, and a variety of other crops. However, fruit from irrigated orchards is the number one crop. This agricultural diversification is a primary reason for the ample supply of upland game bird habitat found in the area.

Foothills along the western edge provide browse lands that are commonly shared by livestock and big game. Commercial timber is harvested along the eastern slope of the Cascade Range.

Yakima Irrigation Project is the largest existing water development. Several dams and manmade or man-altered lakes including Keechelus, Kachess, and Cle Elum are included in this project. Numerous other smaller mountain lakes are distributed throughout national forest lands in the western one-third of the subregion.

HISTORY OF FISH AND WILDLIFE

The Yakima River valley was settled early in territorial history. The settlers depended heavily on wild game and fish to supply their everyday needs.

By the late 1800's fish and wildlife resources had been seriously depleted. Some farsighted individuals had foreseen this depletion and, as early as 1868, had attempted to establish legislative measures to save the resources. Such legislation included a prohibition on market hunting for venison from February to July. This prohibition was broadened in 1875 to include all hunting and closure dates extended from February to September.

Prior to 1880, about 600,000 salmon and steelhead migrated annually into the Yakima Subregion. Of these, approximately 160,000 were caught by about 4,000 Yakima, Klickitat, and Priest Rapids Indians who dried most of the fish for personal consumption and trade. These fish were primarily chinook and sockeye salmon, and steelhead trout.

The precise locations of Indian fisheries are uncertain, but they probably occurred along the mainstem at or near the mouths of major tributaries; around the rapids near the "Horn," Prosser, Washington; and at the Sunnyside damsite. Additional fish from this subregion contributed to Indian fisheries of the Columbia River as well as commercial fisheries operated by early pioneers.

Fish and wildlife resources in Yakima Subregion, and throughout Washington, probably reached their lowest ebb around the turn of the century. Fish, big game, furbearers, and other wildlife resources had declined drastically. Some species had been reduced beyond their ability to recover. More legislative acts and amendments further reduced bag limits on big game and upland game birds and a "bucks only" law was established.

In 1913, a new game code was established; a sport fishing license was required for the first time and exotic game bird stocking was extensive. A year later five game farms were established. By this time introduction and hunting of exotic species was well established. The first open season on Hungarian partridge in the United States occurred in Subregion 3 in 1915.[1/] By 1920, the total anadromous fish spawning run had declined to about 11,000 salmon and steelhead, and sockeye salmon had completely disappeared. However, a relatively successful rehabilitation program[2/], consisting of installing fishways and screens, began about 1920.

1/ This season occurred concurrently in Kittitas County (Yakima Subregion) and Spokane County (Upper Columbia Subregion).

2/ By 1960, salmon and steelhead spawning populations totaled about 19,000 fish attributable to this rehabilitation program.

Game bird liberations, fish releases, licensing, and enforcement generally constituted the State's activities until 1933 when the present Department of Game was created. At that time fish and wildlife management on a sound basis began and policies were established on the basis of the biological data available. In the absence of such information existing management practices were continued until research showed a better approach.

PRESENT STATUS

Yakima Subregion supports anadromous fish, resident fish, big game, upland game, fur animals, waterfowl, and other wildlife. Anadromous fish are generally distributed throughout portions of the watershed accessible to those species. Harvests of anadromous, as well as resident game fish are considered maximum if the present quality fishery is to be maintained. The importance of the Yakima Subregion to fish and wildlife interests cannot be over-emphasized. The Washington Department of Game and Bureau of Sport Fisheries and Wildlife control about 87,000 acres in the three big game and waterfowl ranges shown in table 26. The magnitude of these holdings reflects the importance attached to Subregion 3 from both the State and national viewpoint. Less than half of these lands are owned by fish and wildlife management agencies. Much of the remaining lands are under agreements or short-term leases that can be terminated without warning at the owner's option. Obviously, such an arrangement is not satisfactory from a wildlife management standpoint. Table 26 tabulates the amount of land owned by State and Federal fish and wildlife agencies compared to the amount of land under agreements.

Table 26 - Public Lands Managed for Wildlife, Subregion 3

	Acreage		
Facility	Controlled	Owned	Agreement
Colockum Wildlife-Recreation Area 1/	1,575	1,575	--
Oak Creek Wildlife-Recreation Area	83,775	34,571	49,204
Sunnyside Wildlife-Recreation Area	1,989	1,284	705
Totals	87,339	37,430	49,909

1/ Most of this range lies within Subregion 2.

FIGURE 10. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	Cle Elum State Fish Hatchery	Presently inactive	
2	Naches State Fish Hatchery		38,017
3	Yakima State Fish Hatchery		89,982
4	Nelson Bridge State Rearing Pond		1,279
5	Colockum Wildlife-Recreation Area	1,575 1/	
6	Ellensburg State Game Farm	80	
7	Oak Creek Wildlife-Recreation Area	83,775 (ap.)	
8	Sunnyside Wildlife-Recreation Area	1,990	

1/ Estimated acreage in Subregion 3. Most of this big game range is in Subregion 2.

Estimated expenditures associated with hunting and fishing use of fish and wildlife in Subregion 3 amounted to about $7,880,000. These activities provided about 1,369,000 man-days. Additional values are derived from the commercial uses of anadromous fish and fur animals.

The most significant factors affecting these resources are man's use of subregion waters and lands and his continuing demands upon the fish and wildlife populations. Greater emphasis on fish and wildlife management and research has provided many new tools that are being used primarily to rebuild runs of anadromous fish and enhance or better manage resident fish and wildlife. Figure 10 shows major State and Federal fish and wildlife lands and facilities. These installations and areas are of special importance to one or more kinds of fish and wildlife.

Anadromous Fish

Yakima Subregion is of major importance in the production and harvest of anadromous fish, especially salmon and steelhead trout. However, the commercial and sport fisheries involve fish harvested in several other portions of the Columbia-North Pacific Region, and the total contribution of subregional fish is not known. Because of the widely dispersed harvest of subregion stocks of fish a regional analysis is presented for the present status in the "Regional Summary."

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

YAKIMA SUBREGION 3

1970

FIGURE 10

Resident Fish

Resident game fish species include rainbow, cutthroat, brook, and brown trout, Dolly Varden, kokanee, mountain whitefish, smallmouth bass, and crappie. Nongame fish include squawfish, sucker, carp, sculpin, shiner, and dace.

Habitat

Most fish habitat is suitable for trout or warmwater game fish. Reservoir construction has created water impoundment habitat of significant value; however, decreased flows downstream from these reservoirs have reduced stream habitat.

Use

Approximately 753,000 angler-days are expended annually for resident fish. An analysis of this use is shown in table 27.

Angling for resident fish is a major recreation activity for inhabitants of the subregion. Expenditure for tackle, gear, travel, and lodging by fishermen amounted to $3,750,000 in 1965.

Stream angling is a popular recreational activity. (Washington Department of Game)

Table 27 - Estimated Sport Fishing Use of Resident Fish, Subregion 3, 1965[1/]

Waters	Angler-Days
Streams	444,270
Lakes, Ponds, and Reservoirs	308,730
Total	753,000

1/ Estimates based on Washington Department of Game data.

Sport fishing for resident salmonids drastically reduces fish populations in most accessible areas. Unstocked waters in less accessible areas support native fish populations, but generally not in numbers to provide a significant increase in fishing effort.

Factors Affecting Resource

There are three public trout hatcheries in the subregion. Fishery agencies release about 110,000 pounds of trout within the subregion annually.

Quality salmonid habitat has been reduced by stream channeling, pollution, indiscriminate use of herbicides and pesticides, water withdrawal, highway construction, and competition with nongame fish. Where optimum conditions exist for resident salmonids, warmwater and nongame fish are rare; however, habitat requirements often overlap, and where this occurs competition is extensive. Warmwater and nongame fish are more tolerant of warm water and pollution and often create large populations, which are a source of contamination for rehabilitated waters.

Pollution control, nongame fish control, water diversion screening, and fish passage installation at barriers are beneficial activities influencing resident species.

Big Game

Primary big game species are deer, elk, black bear, mountain lion, mountain goat, and pronghorn antelope. Extensive general hunting seasons are permitted annually on all these species except goat and antelope. A liberal special season on a permit basis is allowed on the highly esteemed trophy goat, but no open season is currently established for antelope.

Habitat

Most forested parts of the Yakima Subregion provide summer and winter range for one or more species of big game. Figure 11 shows the restricted distribution of deer and elk winter range during normal winters. A more severe or longer winter would further restrict these animals. Population density within these ranges varies according to such factors as elevation, slope exposure, and available browse. Lesser populations of deer are generally found on these game ranges throughout the year. Areas occupied by relatively low density, nonmigratory deer populations are also shown.

Mountain goat inhabit the high, rugged, remote, alpine zone. There is little of this habitat in the subregion.

Black bear occur throughout the forested areas of the Yakima Valley and on adjoining slopes. Nationwide surveys of fish and wildlife indicate that Washington has more black bear than any other State. A significant portion of this population is located along the eastern slope of the Cascade Range.

Mountain lion require vast areas of relatively isolated habitat and their distribution generally corresponds to that of deer and elk, their basic food source.

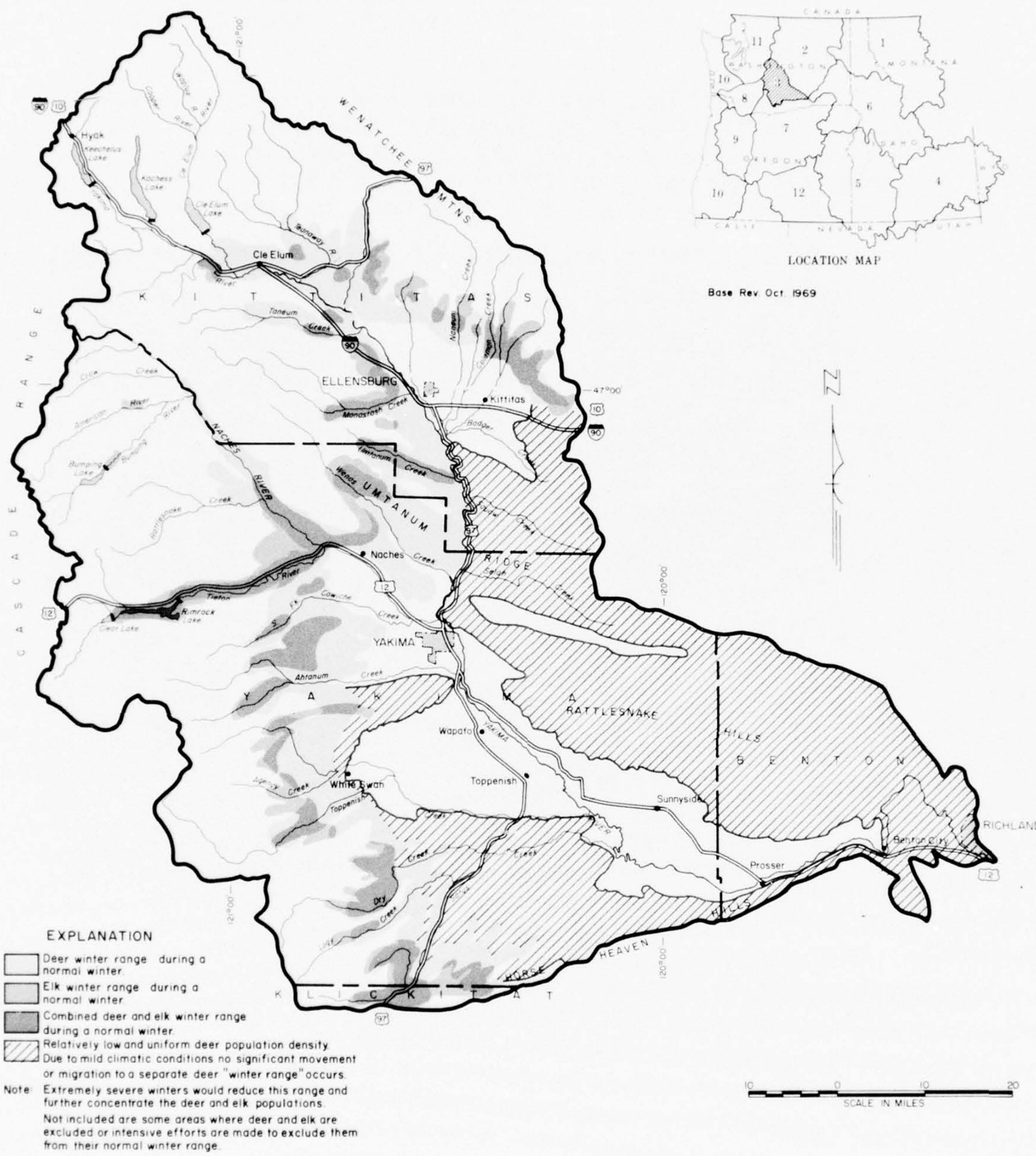
Use

Big game species provided more than 217,000 hunter-days during 1965. Table 28 presents an analysis of this use.

Table 28 - Estimated Hunting Use of Big Game, Subregion 3, 1965[1/]

Species	Hunter-Days
Elk	180,731
Deer	35,143
Bear	964
Mountain Goat	609
Total	217,447

1/ Based on State of Washington Game Harvest Data.



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

DEER AND ELK RANGES

YAKIMA SUBREGION 3

1970

FIGURE 11

The 1965 expenditures for big game hunting were about $2,000,000, indicating to some extent the economic importance of the resource.

Several big game populations inhabit remote inaccessible areas, but the animals are generally forced to migrate to more accessible areas during winter. Such migrations make intensive management and optimum harvests possible. All big game species are considered to be harvested near the practical maximum.

Big game provides sport for a growing number of bow hunters. (Washington Department of Game)

For safety and security both management personnel and sportsmen are excluded from much of the 261,199-acre Yakima Firing Center and the 348,000-acre Hanford Reservation. In addition, harassment of big game during military exercises precludes optimum big game production. Should these areas be managed for wildlife and hunting, some increased production, especially for antelope, and greater use could be anticipated.

Factors Affecting Resource

Lack of winter range is the principal limiting factor for most big game herds throughout Subregion 3. Adequate summer range

is generally provided by forest fires, logging, and agricultural clearing. As early as 1850 water development projects began to inundate the bottomlands and eliminate substantial winter range. Since that time such flooding and agricultural development has excluded big game from thousands of acres of winter range, and drastically reduced big game herds. An examination of figure 11 will show that most water development would destroy flood plain habitat upon which deer and elk depend for winter survival. Major water developments seldom influence mountain goat populations. Minor, private water development such as domestic water storage and small hydroelectric developments can eliminate goat habitat in localized areas. Developments that infringe on higher elevations, such as Kachess Reservoir, also reduce the mountain goat range.

Loss of remote areas due to man's increasing demands for real estate and his ever changing land uses appears destined to eliminate most mountain lion ranges. Possibly only wildlife sanctuaries will maintain these animals.

Upland Game

Upland game species in the Yakima Subregion include ring-necked pheasant, Hungarian partridge, chukar, bobwhite, valley quail, ptarmigan, ruffed grouse, blue grouse, spruce grouse, sharp-tailed grouse, sage grouse, Wilson's snipe, band-tailed pigeon, mourning dove, and cottontail.1/ Numerous exotic species have been introduced, but only pheasant, Hungarian partridge, chukar, and quail have been significantly successful. These species contribute a large percentage of the annual statewide hunter-days attributable to upland game. All species, except ptarmigan, are hunted under liberal regulations designed to insure optimum reproduction consistent with available habitat.

Habitat

Most of Subregion 3 provides a habitat niche for one or more species of upland game. Agricultural lands and/or bottomland hardwood-brush habitat types furnish food and cover for pheasant, quail, dove, ruffed grouse, and rabbit. Blue and spruce grouse are confined to higher elevations of the Yakima River's tributaries associated with coniferous forests.

Sage grouse can still be found where suitable sagebrush exists. The once numerous sharp-tailed grouse has all but disappeared along with the bunchgrass and woodlot habitat it previously occupied.

1/ Includes the native Nuttall cottontail and the introduced Florida cottontail.

The Hungarian partridge is found where farmlands are associated with arid, rolling, sagebrush-bunchgrass habitat. It seldom displays a food preference but adapts to readily available foods. The chukar has similar requirements, but much more restricted feeding habits. It demonstrates a decided preference for cheatgrass as food and prefers semiarid mountain ranges broken by steep, rugged canyons. Other necessary ground cover, in addition to cheatgrass, may include sagebrush and bunchgrass.

The mourning dove is widely distributed throughout the subregion. Orchards close to water and small grain crops provide extensive dove nesting habitat. Mature, well pruned, standard size apple orchards may produce up to 30 birds per acre annually. Limb configuration on dwarf variety apple trees are more suited to modern mechanized orchard culture, but less suited to dove production. Current trends indicate dwarf trees will replace existing orchards and dove production possibly will decline.

Ptarmigan, Wilson's snipe, and band-tailed pigeon habitats are not abundant, but these species are at capacity where suitable habitat exists.

In addition to the cottontail rabbit discussed earlier, the snowshoe hare, pigmy rabbit, and jack rabbit[1/] are found wherever adequte habitat exists. The snowshoe is found associated with brushy thickets in coniferous forests along the eastern slope of the Cascade Range. Jack rabbit and pigmy rabbit are distributed throughout the subregion's arid sagebrush-bunchgrass habitat. The former are extremely abundant while the latter occur only rarely.

Use

During the 1965 hunting season, upland game provided about 288,000 hunter-days. On a statewide basis these hunter-days represent approximately 31 percent of the mourning dove harvested, 23 percent of the quail, 20 percent of the sage grouse, 19 percent of the pheasant, and 17 percent of the chukar. The foregoing approximations are included here to indicate the statewide importance of upland game in Subregion 3. Table 29 presents an analysis of the use for the various species.

Upland game hunters spent about $1,400,000 in 1965. This is another indicator of the importance of these game animals.

Upland game birds are generally harvested to the maximum. Some remote areas or marginal populations contain underharvested

1/ Includes both black-tailed and white-tailed jack rabbit.

grouse populations. Rabbit are generally harvested in conjunction with hunting trips planned for other species and could probably sustain a greater harvest.

Table 29 - Estimated Hunting Use of Upland Game, Subregion 3, 1965 1/

Species	Hunter-Days
Pheasant	158,439
Grouse 2/	13,315
Quail	44,985
Chukar	21,249
Hungarian Partridge	1,631
Sage Grouse	611
Wilson's Snipe	4,181
Band-tailed Pigeon	3,043
Mourning Dove	31,601
Rabbits	9,297
Total	288,352

1/ Based on State of Washington Game Harvest Data.
2/ Includes ruffed, blue, and spruce grouse.

Undoubtedly, the Atomic Energy Commission's Hanford Reservation and the U. S. Army's Yakima Firing Center could provide additional hunter-days if access restrictions were lifted. Since public access to these areas is restricted or prohibited, a reliable use estimate of their existing wildlife resources is not possible.

Factors Affecting Resource

Many native upland game bird species have been eliminated from their historical range through habitat destruction, only to be replaced by exotic species in created habitat. While elimination of bunchgrass and sagebrush habitats through irrigation has seriously reduced sharp-tailed and sage grouse, irrigated lands have produced extensive pheasant and quail populations.

"Clean" farming and other modern agricultural practices have significantly reduced these birds on irrigation project lands. Such practices as elimination of fence rows, replacing standard size apple trees with dwarf varieties, and excessive use of pesticides seriously reduce upland game habitat and populations. If current trends go unchecked, most incidental wildlife resource benefits from irrigation will be negated.

Fur Animals

Beaver, muskrat, and mink are commonly trapped throughout Subregion 3. Other species include raccoon, river otter, striped skunk, spotted skunk, opossum, red fox, weasel, bobcat, coyote, and badger. Marten, fisher, wolverine, and lynx also occur occasionally in higher elevations of the Cascade's eastern slope.

Habitat

Furbearer habitats are extremely diversified. Beaver, muskrat, mink, raccoon, and otter require aquatic habitat. Marten, fisher, lynx, and wolverine need high elevation coniferous forests. Such species as the bobcat, coyote, and badger are found along the desert-forest fringe. All other species, as well as some previously mentioned, are generally associated with agricultural lands. Some species such as skunk, may often be found even in urban areas.

Use

During the 1964-65 trapping season, approximately 3,000 pelts were taken. These included 2,000 muskrat, 460 beaver, 240 mink, and lesser numbers of at least eight other species, but mainly raccoon and striped skunk.

Fur animal harvests are correlated directly with annual fur prices. When fur prices for a given species decline, trapper effort for that species is curtailed and harvests reduced. Most individuals pursue trapping as a hobby or to supplement their income, but there is a point of diminishing returns beyond which these part-time trappers will not expend additional effort. The market value for furs taken during the 1964-65 season was about $13,000.

Factors Affecting Resource

Water development generally has a detrimental effect on furbearers requiring an aquatic habitat. Some exceptions do occur. Muskrat and beaver are often willing to substitute reservoirs and ditch levees for lakes and streambanks. Unfortunately, their characteristic den digging habits generally damage levees, in which case every attempt is made to exclude them from these manmade drainages.

Mink, raccoon, and otter are largely dependent on fish and freshwater invertebrates for their diet. Mudflats along reservoirs do not produce these prey organisms in quantities comparable to streams. The full impact of reservoirs on aquatic related furbearers is not known, but it is known that reservoirs may cause the disappearance of some species.

Species associated with other habitat types are also detrimentally affected by major water development when their habitat is inundated or drastically changed.

Waterfowl

The Yakima Subregion is an important area to migrating, wintering, and resident waterfowl. Principal species found in the valley include, but are not limited to, mallard, gadwall, American widgeon, green-winged teal, blue-winged teal, cinnamon teal, shoveler, pintail, redhead, canvasback, scaup, goldeneye, bufflehead, ruddy duck, coot, snow goose, white-fronted goose, Canada goose, Ross' goose, and whistling swan. Other species are occasionally observed.

Habitat

Yakima Valley's rolling irrigated bottomlands provide some ideal waterfowl habitat. The area is a vast checkerboard of irrigation canals and ditches, which provide significant surface water acreage for most resident waterfowl.

Waterfowl management agencies and private hunting clubs have expressed keen interest in acquiring the subregion's waterfowl habitat. Both State and Federal agencies have acquired or are acquiring lands specifically for waterfowl management. Figure 10 shows one State-operated waterfowl range and several State big game ranges which provide additional waterfowl habitat. In addition, large tracts of land are held in private ownership and managed for the express purpose of attracting waterfowl to private duck clubs.

Considerable acreages of corn and other small grains provide food for dabbling ducks. Rivers, streams, reservoirs, canals, and other waterways provide the aquatic food organisms required by diving ducks.

Use

More than 104,000 man-days were spent hunting ducks and geese during 1965. An analysis of this use is shown in table 30.

Hunters spent approximately $700,000 hunting waterfowl in 1965. The subregion's waterfowl harvest figures represent approximately 13 percent of the statewide duck and 2 percent of the statewide goose harvests.

Table 30 - Estimated Hunting Use of Waterfowl, Subregion 3, 1965 1/

Waterfowl Group	Hunter-Days
Ducks	103,651
Geese	668
Total	104,319

1/ Based on State of Washington Game Harvest Data.

Factors Affecting Resource

The 110 years of irrigation in the Yakima Valley has had a beneficial effect on migratory waterfowl. Resting and feeding facilities provided by extensive networks of "open water" storage and drainage ditches have been a major contribution to the waterfowl program. Unfortunately, breeding and nesting habitat is not a natural by-product of irrigation projects. Necessary water level fluctuations associated with irrigation, especially during the nesting season, often "flood out" nests or leave them exposed to excessive predation from terrestrial predators. Additionally, such fluctuations inhibit growth of shallow water aquatic organisms utilized by some waterfowl as food. Tolerances in water level fluctuations are not completely understood, but such fluctuations have generally proved detrimental.

Increasing maintenance on canals and drainage ditches, i.e., dragging, bulldozing, burning, and spraying required to more efficiently move water and control weeds, has had a decided adverse effect on waterfowl nesting and resting in the Yakima Valley.

Other Wildlife

Numerous songbirds, small mammals (including those generally referred to as predator or "varmint"), amphibians, and reptiles comprise the other wildlife. Some of these species perform integral and important roles in predator/prey relationships or pest control, while others have more obscure positions in the subregion's total ecology. Several wildlife species are classified in more than one group. Some fur animals, such as bobcat and coyote, are often classed as predators; and some so-called predators such as bear are also classed as big game.

Habitat

Every habitat niche found in Subregion 3 is occupied by one or more of the "other wildlife" species. Land loss through inundation

or any other means is a loss of habitat and has its accompanying wildlife loss. Since hunters finance most wildlife management agencies, a reasonably complete life history and knowledge of requirements is available on those "other wildlife" species typically sought by hunters. Those species that provide hunting are studied more intently than other animals in this same general category. It should be emphasized that a lack of data and available space, not a lack of significance, prohibits further comment on the hundreds of songbird and other nongame species.

Use

During 1965 an estimated 10,000 hunter-days were expended hunting the various species that make up "other wildlife." Such specialized hunting as "predator calling" (coyote, crow, bobcat) and "varminting" (woodchuck, ground squirrel) will undoubtedly intensify. In other regions, as stocks of more desirable game species have been depleted, these birds and animals received increasing utilization. However, due to a lack of data, quantitative estimates of potential use and harvests are not available.

Factors Affecting Resource

Any loss or drastic disturbance of habitat, whether it results from water development, urbanization, highways, or any other means, generally results in a loss of carrying capacity. Insecticide application can eliminate birds from urban neighborhoods causing those insects normally controlled by these eliminated birds to multiply out of control. This ultimately necessitates more and heavier applications of the insecticide. Poisoning of rodents often reduces coyote and bobcat by reducing their natural food supply. Thus the "varminter" not only loses rodents as a target, but also bobcat and coyote. In addition agricultural and livestock interests tend to encourage unrealistic predator control measures often severely reducing such species as bear. Such uncontrolled measures are extremely detrimental to "other wildlife."

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

Freeflowing reaches of at least 10 streams should be preserved and protected against any alteration detrimental to the fishery. Habitat improvement, fish passage facilities, and artificial

propagation measures may all be required to insure retention of important anadromous and resident fisheries. Harvests of these fisheries can be enhanced by providing public access to fishing waters. Anadromous fish produced in Subregion 3 appear in commercial and sport catches in other subregions.

Fish and wildlife managing agencies own or control a significant amount of valuable wildlife habitat in this subregion. In addition, the subregion's agricultural land has provided extensive upland game habitat. Opportunities to further enhance game populations, improve or preserve habitat, or increase harvests of existing populations without adverse effects on future populations should be pursued. Furthermore, detailed studies will be required to identify specific projects or measures to enhance fish and wildlife populations in Subregion 3.

Fishing

The Yakima Subregion will need to provide opportunities for an additional 1,054,000 angler-days for resident fish by year 2020. In addition, a proportional share of the regional anadromous fish needs for sport and commercial fishing will need to be satisfied in this subregion.

Habitat Preservation

The Yakima Subregion has several river sectors worthy of preservation for fishing purposes. Rivers of greatest potential are listed below:

Yakima River - all

Naches River - all
  American River - all
  Bumping River - all
  Tieton River - all
    North Fork - all
    South Fork - all

Teanaway River - all
  North Fork - all
  Middle Fork - all
  West Fork - all

Cle Elum River - all

Habitat Improvement

As in other subregions, municipal, industrial, and agricultural pollution is a problem. In order to maintain a good fishery, water quality must be near optimum. State and Federal water quality standards must be updated and adhered to.

Pesticides and certain fertilizers are a serious problem in some areas. Standards for pesticide application and control of irrigation returns need to be developed and enforced.

Other means of habitat improvement include improvement of old fish ladders and removal of unused or low-value dams. Unrestricted passage will allow fish to use spawning and rearing areas which are presently inaccessible. Old ladders may not be adequate at all water levels or may not be sufficiently attractive to all fish. Streams where these problems are known to exist are listed below:

Little Naches River, river mile 7 through 14 - falls need improved passage

Yakima River
- Horn Dam - improve existing fishways
- Sunnyside Dam - improve existing fishways
- Wapato Dam - improve existing fishways
- Roza - improve existing fishways
- Town - improve existing fishways
- Easton - construct new fishways
- Tieton - construct new fishways
- Cle Elum Dam - construct new fishways
- Kachess Dam - construct new fishways

In addition to fishways for adult upstream passage, screens need to be provided in all water diversions to protect juvenile downstream migrants.

The following streams need log jams removed to allow better access for migrant fish, provided resident fish habitat is not unduly damaged:

Tieton River - entire river
Bumping River - entire river
Rattlesnake Creek - entire river
American River - river mile 15

The Bumping Lake Enlargement report1/ lists streamflows that would be desirable for fish production purposes. A more detailed

1/ Bumping Lake Enlargement, Yakima Project, Washington, March 1968, Joint Feasibility Report by Bureau of Reclamation and Bureau of Sport Fisheries and Wildlife.

comprehensive plan of development may suggest storage sites that could supply needed flows. Improved programming and coordination of water releases from the five major irrigation storage reservoirs in the Yakima River system would substantially enhance stream habitat.

A suitable selective poison is needed for rough fish control in this subregion since the Yakima River from Ellensburg to the mouth is seriously contaminated with nongame fish. Reduction of the nongame fish population would add significantly to the productive capacity of the river both for resident and anadromous species.

Measures for improving stream and lake habitat would require more detailed investigation. Estimated cost for such investigation would be about $100,000. The following lakes need improvement by 1980. Estimated cost for lake habitat improvement measures is $350,000.

Bear Lake - apply bentonite in outlet seepage area
Lynne Lake - construct dam and outlet structure
Ty Lake - construct dam and outlet structure and relocate road
Mud Lake - construct dam and outlet structure
McDaniel Lake - apply bentonite in seepage area
Fish Lake - construct dam and outlet structure
Highway Ponds - reconstruct dikes

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 31.

Greater Harvest

There is little opportunity for increasing the harvest of anadromous fish. These stocks are being used to capacity, with the possible exception of Yakima River steelhead.

Natural production of resident trout cannot keep pace with angler demands and sport angling is largely dependent upon artificial propagation. Increased public access would increase opportunities for resource use. However, this would also require increased fish stocking.

There are many potential public access sites along 440 miles of riverbanks and 341 miles of creeks outside federally owned or controlled properties in the subregion. Pedestrian easements, boat launching sites, and parking areas along desirable portions of these rivers and creeks should be acquired between 1980 and 2000. Access to a number of small lakes and borrow pits adjacent to the river system should be acquired by 1980.

Table 31 - Fish Habitat Improvement Means, Subregion 3

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Stream improvement	mile	70	140	110	220	100	200
Lake improvement	acre	450	338	610	458	600	450
Sub-totals			478		678		650
Planning							
Fish stream surveys	mile	340	11	Not available		Not available	
Fish lake surveys	acre	5,240	42	Not available		Not available	
Sub-total			53				
Total			531				

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement							
Stream	mile	18)	983	35)	468	40)	712
Lake	acre	1,690)		776)		1,122)	
Fish lakes	acre	50	75	25	37	25	37
Totals			1,058		505		749

Warmwater fish have a capacity for increased use without a significant increase in populations. Future needs for warmwater fishing can be satisfied through year 2020 without additional measures.

Augmentation of Supply

The following sites have potential for rearing anadromous fish. Additional studies will be required to fully evaluate them.

Abandoned irrigation canal, Yakima River, near Richland, Washington
Richland Pond, Yakima River, at Richland
Horseshoe Pond, Yakima River, near Mabton
Barker Pond, Yakima River, near Richland

There are probably other unidentified sites. In addition to rearing ponds, enlargement of present hatchery facilities is required to produce both anadromous and resident fish for stocking subregional waters. It may be necessary to use hatchery systems outside the subregion to provide fish for the Yakima River system.

Hunting

By 2020, Subregion 3 will have to provide for increased hunting needs equal to about 700,000 hunter-days.

Large tracts of selected wildlife habitat have already been set aside predominantly for the use of this area's big game herds. Based on current technology, these acreages are managed at or near optimum production. Whenever additional big game winter range becomes available, it should be acquired and set aside to maintain the herds. Advanced technology will undoubtedly contribute to even greater future big game resources in the Yakima Subregion if historical key winter range can be retained.

Furbearers and other nonhunted wildlife forms can expect to benefit from current and future wildlife management measures. Opportunities to enhance the nonhunting use of these species should be actively promoted.

Habitat Preservation

Several areas along Toppenish Creek offer excellent opportunities to expand waterfowl facilities. These expansion measures should ultimately be an integral part of any waterfowl system designed in Subregion 2. Approximately 7,300 acres have been identified as potential beneficial additions to existing waterfowl areas or as new waterfowl developments for Subregion 3 (Yakima and Benton Counties).

About 240 acres of upland game habitat in Yakima County have been identified for purchase. More detailed studies will be needed to determine where additional opportunities exist.

As in most adjacent subregions, preservation of big game winter range is paramount in planning for the future of big game populations. Natural winter ranges must be identified and set aside for big game herds. Loss of any winter range (figure 11) will ultimately and permanently reduce the big game population in direct proportion to the lost winter habitat. Nearly 285,000 acres in Kittitas and Yakima Counties have been identified for early purchase in Subregion 3. Purchase of management and hunting rights on these lands will enlarge existing game management areas and establish new ones.

Many nongame species will benefit from preservation of habitat for game species, but other areas will undoubtedly be required specifically for nonhunting use as the public demands them. Further studies will also be required to identify such areas.

Habitat Improvement

If additional lands are irrigated, such as Ahtanum, Kennewick, Horse Heaven Hills, Moxee White Swan, and Mabton, new opportunities to increase upland game and waterfowl populations can be expected. However, near maximum potential is currently being realized on farmlands under existing agricultural practices. Suggestions for obtaining lasting game bird benefits from irrigation projects are not discussed in detail here. However, as additional irrigable lands are identified, scattered habitat "plots" and native vegetation "belts" should be considered in project plans, especially where canal right-of-ways are purchased with public funds. A more detailed discussion of such opportunities appears in the "Regional Summary," "Means to Satisfy Needs."

Habitat improvement can often be accomplished by supplying a single essential element that is missing in the area's ecological composition. The elements are generally classified as food, cover, and water. An example of such a technique that may have application in Subregion 3 would be the use of cisterns or gallinacious guzzlers to extend game bird ranges in waterless areas where usable food and cover are abundant. Estimated costs of facilities such as these range from $125 to $1,200 each, depending on how they are constructed and accessibility of the site. Detailed field studies will be necessary to identify potential sites for these facilities.

Certain practices need changing within existing irrigation projects to replace vital, rapidly diminishing edge cover essential to upland game. Agricultural practices, many government-supported, that bring about drainage, land leveling, weed control, removal of

fencerows, cultivation, and canal, drain, and streambank cover removal are very deleterious to wildlife. In addition, new cultivation and cropping patterns, and the direct and indirect effects of chemicals impair food supplies of upland game. Urbanization, road construction, channeling, drainage and some crops reduce living space for game. Counter measures, curtailment, and consideration for wildlife by agricultural agencies would bring about improvement.

Since this subregion winters a significant portion of the mallards of the Pacific Flyway, improvements in the winter-holding quality of its habitat can make a measurable contribution to future hunting. Available grain food supplies, primarily field corn residues, and protected, year-round open water are basic elements of this prime waterfowl environment. Artificial drying of corn has recently made earlier harvest and cultivation possible which reduces food supply for ducks. Assured food supply, either by purchase of specific cornfields or by payments to delay cultivation plus retention of unmolested open water resting sites, are improvement goals. A detailed discussion of what such enhancement opportunities might consist of can be found in the "Regional Summary," "Means to Satisfy Needs."

Significant agreages of big game habitat already are owned and operated by the Washington Department of Game. Optimum development of these lands for wildlife and general recreation is an ongoing program. However, attempting to satisfy any significant portion of the forecast future needs for hunting through habitat improvement, is probably an insurmountable task in Subregion 3. Rather extensive winter feeding programs are already necessary to sustain elk herds in the Oak Creek Wildlife-Recreation Area.

As in the Upper Columbia Subregion, planning for big game enhancement will generally be limited to reclaiming historical winter range, such as orchards, where deer are currently being excluded. Opportunities for upgrading existing big game habitat (especially winter ranges) are discussed in detail in the "Regional Summary," "Means to Satisfy Needs." However, these measures are equally applicable to summer range where improvements are indicated. The discussion categorizes opportunities under the headings of "Ecosystem Manipulation;" "Timber Management for Big Game;" "Browse Farming;" "Zoning for Big Game;" "Control of Livestock Grazing;" and "Mechanical Devices."

Most measures undertaken to benefit one specific wildlife group will also serve some furbearers and "other wildlife." However, where needs for these groups become apparent, specific measures may be recommended for upgrading their habitat. Presumably the increased nonhunting use of many "other wildlife" species will

help justify whatever measures are required to insure their survival. Certainly funds from other than hunting license sales must be made available if these groups are to be effectively managed.

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are included in table 32.

Greater Harvest

Certain species have the reproductive capability to stand greater harvests. Notably, forest grouse species (especially during high population cycles); isolated mountain goat herds; and small antelope herds that are not currently hunted, are in this category. One source of added upland game harvest would be acquisition of hunting rights on the Yakima Firing Center. Another source of added harvest, especially for big game, would be through the purchase of hunting rights on the 1.1 million-acre Yakima Indian Reservation. However, the extent of these potentials is not well documented. Further study may help identify when and where additional harvests can safely be undertaken and develop methods to encourage hunters to do so. The latter effort will generally require indoctrinating hunters toward hunting in less accessible areas where returns per unit of effort are exceptionally low. Such low returns can be attributed to sparse game populations, difficult terrain, dense vegetative cover, or a combination of these influences.

Access to any area can be provided but hunters must spend more time per game animal harvested if "greater harvest" is to contribute significantly to satisfying future needs. For most species, under existing hunter mores, the present return per unit of effort appears to be a realistic barrier to increased harvests.

Augmentation of Supply

Subregion 3 is currently stocked with more game farm birds per acre than any other subregion in Washington. About 14,000 pheasant are released annually for brood stock, and/or the hunter's gun. Chukar and Hungarian partridge are also raised and released as brood stock. Although new exotic species will undoubtedly be introduced, there is no indication that such introductions will contribute significantly to satisfying hunting needs during this study period.

Game farming will become increasingly important in satisfying hunter needs throughout this study period. Because of its reputation as a game bird hunting center and its proximity to Washington's urban centers, Subregion 3 will be faced with increasing pressure on hunting resources. Since natural production will probably not keep pace with these demands, additional game farm facilities must be planned.

Table 32 - Wildlife Habitat Improvement Means, Subregion 3

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Seeding and planting	acre	2,620	262	3,430	343	3,420	342
Forage release & prescribed burning	acre	2,400	60	3,100	78	3,100	78
Key area fencing	mile	20	20	30	30	20	20
Permanent openings	acre	2,190	219	2,820	282	2,820	282
Wildlife food crops	acre	2,040	--	1,540	--	1,540	--
Guzzlers	each	10	10	20	20	20	20
Shallow impoundments and marsh improvements	acre	10	8	30	23	20	15
Sub-totals			579		776		757
Planning							
Big game range analysis	acre	693,600	69	Not available		Not available	
Upland game habitat surveys	acre	550,000	28	Not available		Not available	
Habitat management plans	each	77	39	Not available		Not available	
Sub-total			136				
Total			715				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement 1/	acre	334,000	352	416,000	520	578,000	775
Land acquisition 2/	acre	247,000	9,962	82,000	3,291	162,000	6,460
Fencing 3/	mile	35	12	12	18	18	27
Water developments 4/	each	100	7	47	3	74	5
Totals			10,333		3,832		7,267

1/ Includes cover plots, food patches, fencing, marsh development, potholes, nest structures, etc., not identified specifically in the table.
2/ Obtained by fee purchase and easement rights.
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land.
4/ Consists primarily of guzzler installations and spring development (including fencing) by agreement on private land (can include nest structures in other subregions).

Estimated capital costs for a capacity of 10,000 birds is about $255,000. Thereafter, annual operation, maintenance, and replacement costs are estimated at $3 per bird. Early action programs should provide for a minimum 50-acre game farm within Subregion 3.

Game farming for other hunted species will probably not be a significant factor in satisfying hunter needs prior to 2020. Game farming for waterfowl has gained a certain degree of acceptance in eastern states, but there are no indications that western hunters will be prepared to extensively utilize private waterfowl shooting preserves in the foreseeable future.

Big game ranches are in a similar position. While they are successful in some areas of the country, especially for exotic big game species, Yakima Subregion's hunters are not yet ready to alter their hunting customs to include this type of hunting. A more complete discussion of both waterfowl game farms and big game ranches is in the "Regional Summary," "Means to Satisfy Needs."

Winter feeding of subregion big game is a beneficial management measure. (Washington Department of Game)

One of the most intensive big game winter feeding programs in the western states is currently being conducted in Subregion 3. Such programs are always expensive and consequently justification has been difficult. In 1968, prepared pelletized deer food cost approximately \$68 per ton; hay of the necessary protein content to sustain wintering animals cost \$33 per ton. Despite the cost, this has been a highly successful program for this particular area. In fact, so successful that summer range carrying capacity may have been exceeded and summer range improvements may be in order. In addition to preventing mass starvation during severe winters, feeding programs tend to: (1) reduce population fluctuations in normal population dynamics thus stabilizing huntable populations; (2) reduce competition for browse between elk and deer where their ranges overlap; and (3) increase public acceptance of annual either-sex harvests, normally lost for several seasons following a decimating winter.

Winter feeding of other wildlife forms may serve a functional purpose in selected areas. Providing artificial winter food supplies during severe winters (about 5-year frequency) will help to over-winter game bird breeding stocks. Certainly, no technique to supplement artificially or to increase natural wildlife populations should be overlooked. However, opportunities for this type of extremely intensive management have not been well defined. More detailed studies will be required to determine where and when such practices will be feasible and acceptable to the hunter.

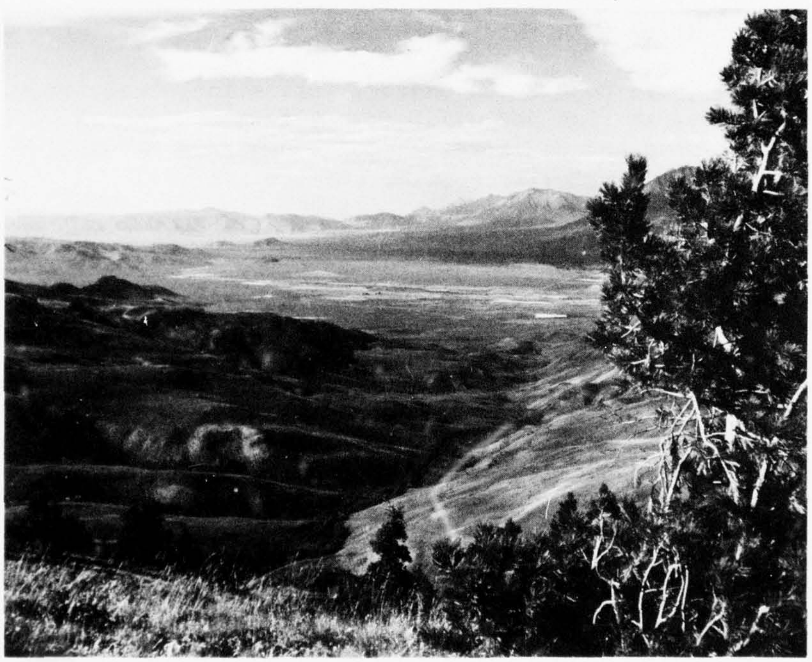
LOCATION MAP

SUBREGION 4

SUBREGION 4, UPPER SNAKE

GENERAL DESCRIPTION OF SUBREGION

Approximating 35,800 square miles in size, the Upper Snake Subregion is located primarily in southeastern Idaho but extends into northwestern Wyoming, northwestern Utah, and northeastern Nevada. Mountains border the subregion on the east, south, and north sides. The Snake River begins in the mountains amid peaks west of the Continental Divide and flows past the majestic Teton range which rises to nearly 14,000 feet. This contrasts with an elevation of 2,600 feet about 300 miles to the west where the Snake leaves the subregion at King Hill, Idaho. Such great elevational differences produce wide variations in climatic conditions and vegetative types. Vegetation varies from semi-desert species in the lowlands to lush forests in mountains of the east and north. This in turn provides habitat for a great variety and abundance of fish and wildlife species.



Diversified terrain and vegetation provide a variety of fish and wildlife habitat. (Idaho Fish and Game Department)

HISTORY OF FISH AND WILDLIFE

Fish and wildlife have always been of great importance to the area. They provided a source of food and clothing for the Indians and later for the fur trappers, immigrants, and early settlers.

In the early 1800's during the great fur-trading period, anadromous fish--salmon and steelhead trout--still migrated to Shoshone Falls on the Snake and up Salmon Falls Creek into Nevada. Resident fish--Dolly Varden, cutthroat trout, mountain whitefish, and white sturgeon--were plentiful in the streams and numerous lakes. Nongame fish--notably sucker, Utah chub, and squawfish--were present but presumably did not significantly interfere with game fish populations.

The subregion was rich in game resources. Elk, mule deer, moose, bighorn sheep, and pronghorn antelope abounded, and bison were plentiful especially in the Teton Valley. These big game herds supported the great predators--wolf, grizzly bear, and mountain lion. Sage grouse and sharp-tailed grouse were abundant. Waterfowl nested and wintered in large numbers along the Snake River system. The abundant fur animal resource, especially beaver, was the major attraction that drew the first influx of white men.

As the human population and activities increased, drastic changes occurred in fish and wildlife habitat. In the early 1900's, irrigation farming and power developments began in earnest, and the effects on fish and wildlife soon became apparent.

Construction of Swan Falls Dam in 1901 on the Snake River downstream from the subregion blocked anadromous fish migrations. In addition, large irrigation development projects, such as American Falls Reservoir, Blackfoot Reservoir, and the Minidoka Project, changed the environment for resident fish. Decreased streamflows downstream from many of the dams, increased temperatures in the reservoirs, and stream pollution from the growing cities combined to make conditions unsuitable for game fish in many areas. Conversely, nongame fish thrived in the new environment and extended their influence to the further detriment of game fish. To combat these negative influences and to satisfy a rising tide of sport fishermen, trout stocking, chemical treatment of streams infested with rough fish, and other management measures were instituted and exotic species were introduced in suitable habitat. These included kokanee, Arctic grayling, and golden, brown, brook, rainbow, and lake trout.

The increasing human population and associated developments affected big game. Excessive hunting and trapping depleted animal numbers. In addition, extensive farming, livestock grazing, reservoirs, mining, logging, highway construction, and suburban sprawl all contributed to decrease the habitat. As a result, populations of bison, grizzly bear, wolf, and mountain lion were drastically reduced. Important range for elk, mule deer, moose, bighorn sheep, and pronghorn antelope was reduced, and the intensified use caused deterioration of the remaining habitat.

Sage grouse and sharp-tailed grouse ranges were greatly altered, but the agricultural practices permitted introduction and establishment of other upland game, including ring-necked pheasant, valley quail, chukar, and Hungarian partridge. Waterfowl and fur animals were both detrimentally and beneficially affected by human developments. Although farming, grazing, and reservoirs destroyed habitat, irrigation distribution systems created new habitat for these resources.

In short, the fish and wildlife situation has changed much over the years. Mostly, the changes adversely affected the resources, although some bright spots remain and the role played by fish and wildlife continues to be significant.

PRESENT STATUS

The groups of fish and wildlife present in the Upper Snake Subregion comprise resident fish, big game, upland game, fur animals, waterfowl, and other wildlife. All of these resources are of recreational and commercial importance. The use of most groups is somewhat below the maximum. However, capacity for increased use exists mainly in deer hunting, upland game hunting, and fishing for resident fish. Because of the varied topography and land use, there is exceptional variety in habitat and in the species of fish and wildlife found here. Some species which live in this subregion occur only in limited numbers elsewhere. This subregion holds a position of national significance in providing suitable habitat for many species.

Figure 12 locates and identifies State fish hatcheries, State wildlife management areas, big game ranges, Federal hatcheries, and national wildlife refuges or big game ranges. All of these facilities and lands are of special value to one or more kinds of fish and wildlife.

Resident Fish

Rainbow trout, brook trout, and cutthroat trout are the principal resident salmonids. Cutthroat trout occur mainly in the upper reaches of the mountain waters and are the main salmonid species in the Snake River drainage of Wyoming. Kokanee, lake trout, Arctic

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COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)
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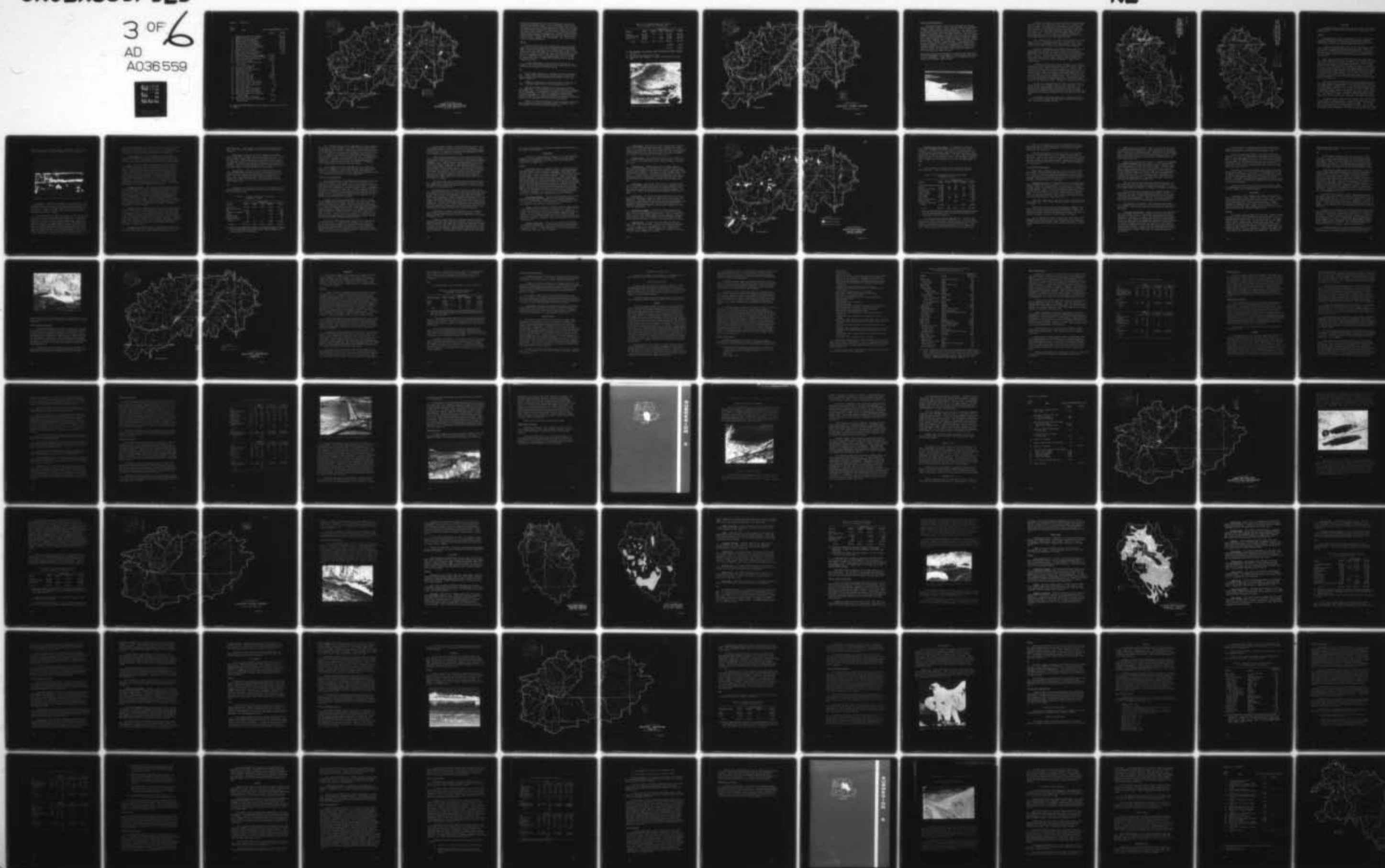
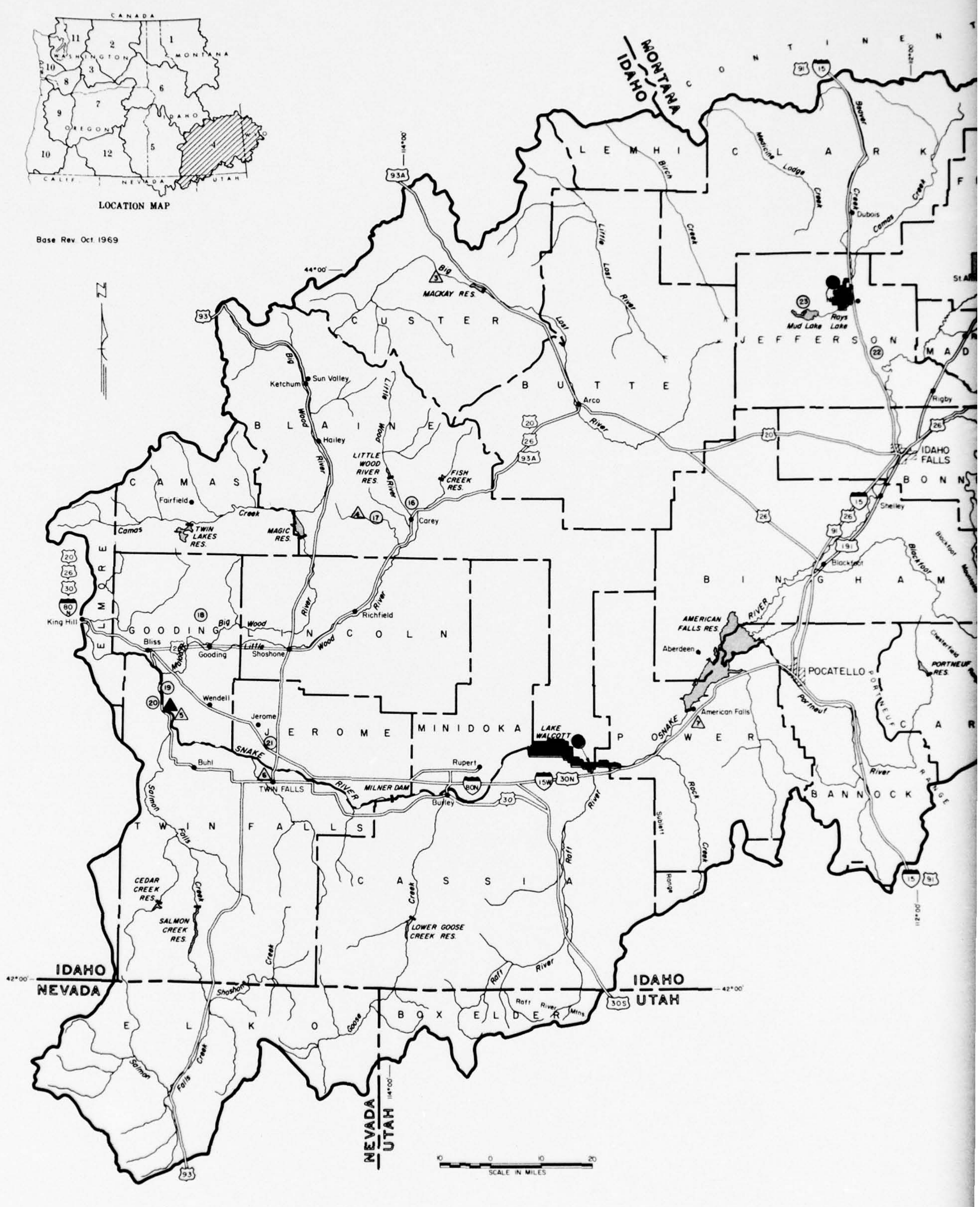


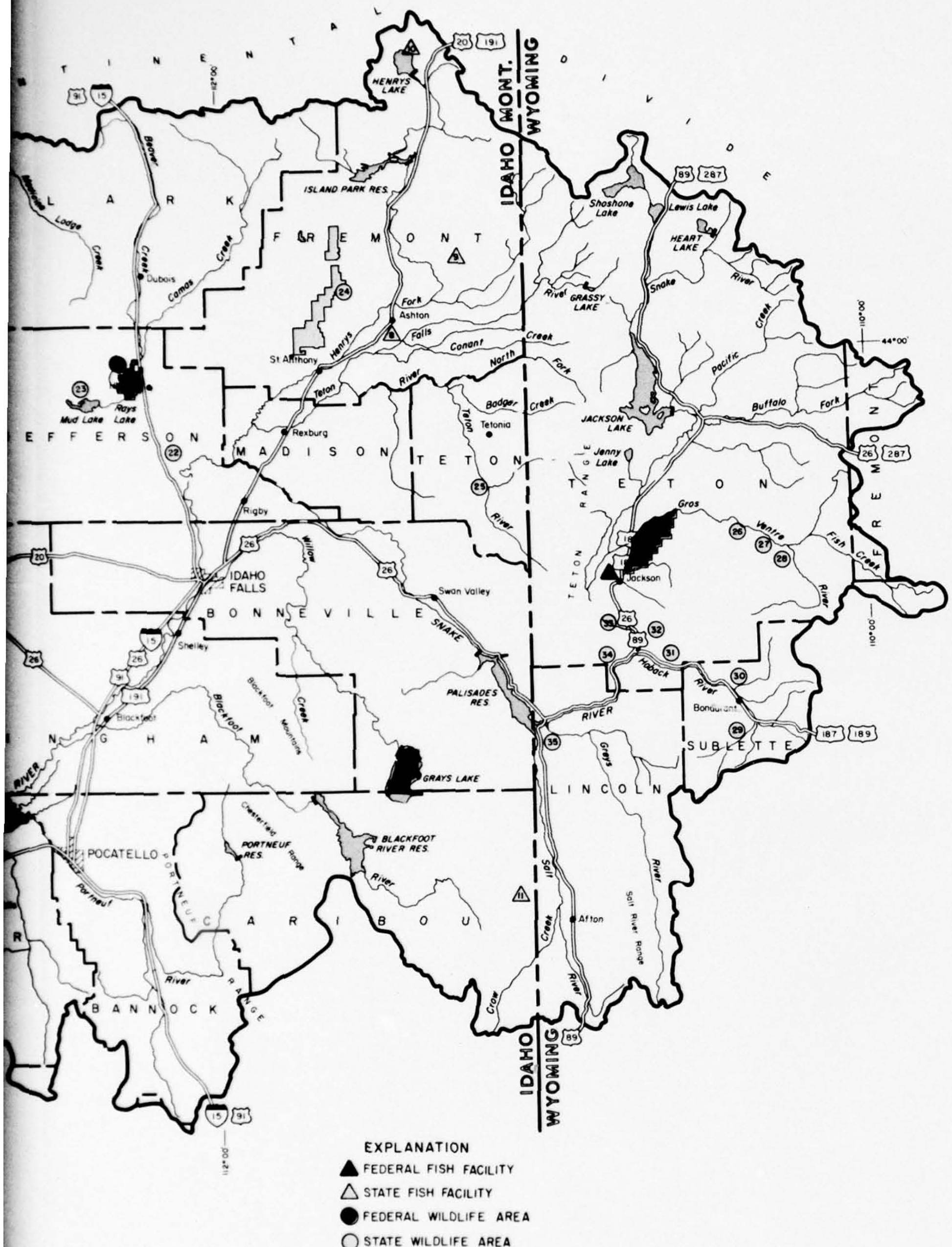
FIGURE 12. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	Hagerman National Fish Hatchery		266,322
2	Jackson National Fish Hatchery		36,601
3	Mackay State Fish Hatchery		70,097
4	Hayspur State Fish Hatchery		46,567
5	Hagerman State Fish Hatchery		426,945
6	Twin Falls State Fish Hatchery		23,230
7	American Falls State Fish Hatchery		164,810
8	Ashton State Fish Hatchery		47,275
9	Warm River Fish Hatchery		2,931
10	Henrys Lake State Fish Hatchery		961
11	Auburn State Fish Hatchery		28,351
12	Minidoka National Wildlife Refuge	25,630	
13	Grays Lake National Wildlife Refuge	12,000	
14	Camas National Wildlife Refuge	10,471	
15	National Elk Refuge	28,840	
16	Carey Lake State Wildlife Mgt. Area (WMA)	750	
17	Silver Creek State WMA	400	
18	Dog Creek State WMA	181	
19	Billingsley Creek State WMA	275	
20	Hagerman State WMA	445	
21	State Game Farm	40	
22	Market Lake State WMA	4,848	
23	North Lake State WMA	8,370	
24	Sand Creek State WMA	26,915	
25	Teton River State WMA	472	
26	Alkali Creek State Feed Ground	-- 1/	
27	Gros Ventre State Feed Ground	160	
28	Fish Creek State Feed Ground	-- 1/	
29	Cull Feed Ground	-- 1/	
30	Dell Creek State Feed Ground	-- 1/	
31	Camp Creek State Feed Ground	148	
32	Horse Creek State Feed Ground	160	
33	South Park State Feed Ground and Winter Range	3,579	
34	Dog Creek State Feed Ground	-- 1/	
35	Greys River State Feed Ground and Winter Range	4,184	

1/ Under 10 acres; operated by State under U.S.D.A. Forest Service permit.


LOCATION MAP
Base Rev. Oct. 1969
CANADA
WASHINGTON
MONTANA
OREGON
IDAHO
NEVADA
UTAH
MONTANA
IDAHO
LEMHI
CLARK
JEFFERSON
CUSTER
BUTTE
BLAINE
CAMAS
ELMORE
GOODING
LINCOLN
JEROME
MINIDOKA
TWIN FALLS
CASSIA
BINGHAM
BANNOCK
ELKO
BOX ELDER
MACKAY RES.
Mud Lake
Rays Lake
Dubois
Ketchum
Sun Valley
Hailey
Arco
Rigby
IDAHO FALLS
Shelley
Blackfoot
LITTLE WOOD RIVER RES.
FISH CREEK RES.
Carey
Fairfield
TWIN LAKES RES.
MAGIC RES.
King Hill
Richfield
Bliss
Gooding
Shoshone
AMERICAN FALLS RES.
Aberdeen
POCATELLO
PORTNEUF RES.
Wendell
Jerome
LAKE WALCOTT
American Falls
Buhl
TWIN FALLS
MILNER DAM
Rupert
Burley
CEDAR CREEK RES.
SALMON CREEK RES.
LOWER GOOSE CREEK RES.
IDAHO
NEVADA
IDAHO
UTAH
NEVADA
UTAH
SCALE IN MILES

2



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

UPPER SNAKE SUBREGION 4

1970

FIGURE 12

grayling, and golden trout have been introduced, the latter in selected high mountain lakes. Five of the largest lakes in the Wyoming portion of the drainage support lake trout, providing popular angling, with Jackson Lake holding the Wyoming record. Dolly Varden and brown trout occur in some streams. Mountain whitefish are found in many streams. Other fish which provide sport fishing include perch, bluegill, largemouth bass, crappie, green sunfish, channel catfish, sturgeon, and brown bullhead. The following fish also occur here: sucker, carp, chiselmouth, chub, shiner, dace, sculpin, and fathead minnow.

Habitat

Habitat for resident fish includes many clear, cold, small streams in the higher elevations, more than one hundred natural lakes, reservoirs of various sizes including four of over 16,000 surface acres each, and larger rivers in the lower valleys. Total water area is about 266,700 acres. There are about 5,285 miles of stream. In addition, waters on private lands include a minimum of 1,119 farm ponds with an estimated average size of 1/2 acre, 31 stocked fish ponds, 4 managed fish ponds, and 127 irrigation storage reservoirs.

Stream classifications are available for 4,120 miles of streams. These are shown on figure 13, a map combining the stream classification systems of Idaho and Wyoming.

Use

Annual sport fishing use is estimated at 705,000 fisherman-days. Trout fishing provides more than 95 percent of the total. Sport fisherman use was divided among three kinds of waters, as shown in table 33.

Commercial fishermen took 1,657,938 pounds of rough fish in 1965. A limited amount of bait fish was seined for sale.

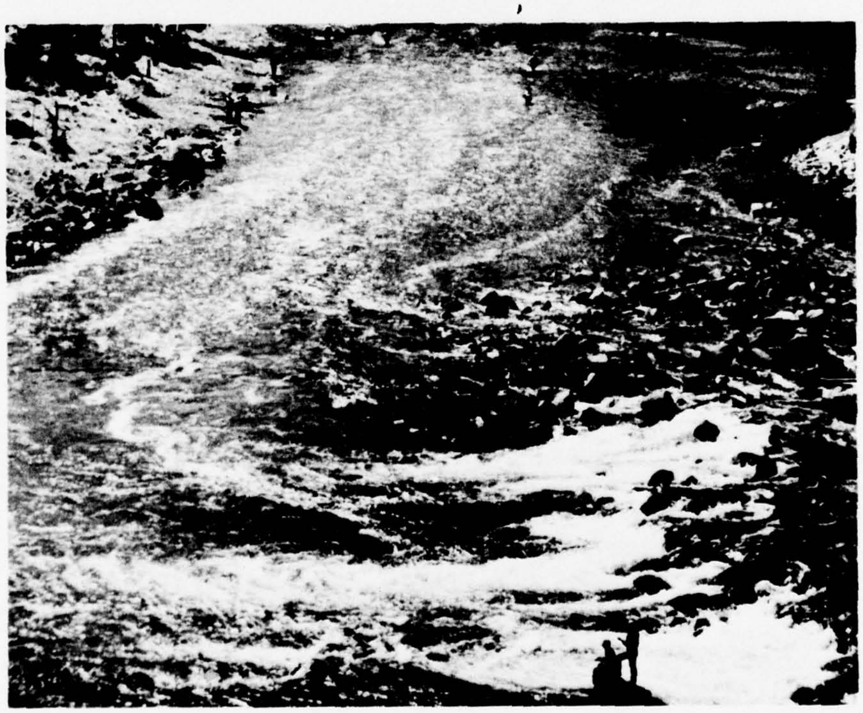
Much of the sport fishing here is of national as well as local importance. In 1965 fishermen spent about $3,500,000 fishing for resident fish. The opportunity for quality trout fishing amidst scenic surroundings is one of the outstanding attractions for visitors to Subregion 4. Hence, fisherman use is influenced by esthetic values which are difficult to measure monetarily, and dollar figures do not represent the total value of the resource.

Capacity in terms of fishing use which the resource could sustain at the present rate of fisherman success is unknown, but it would probably be considerably above current use.

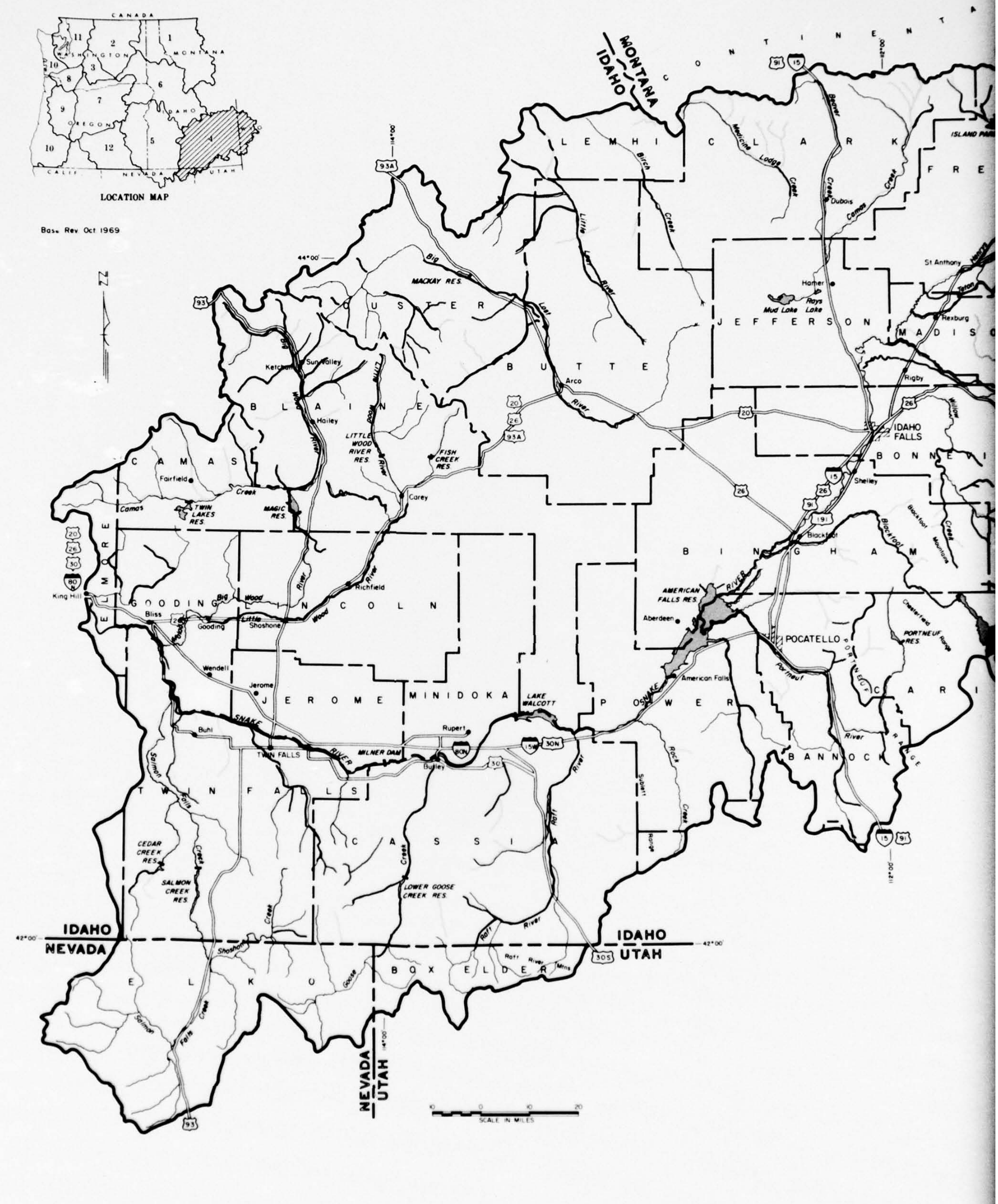
Table 33 - Estimated Annual Sport Fishing Use of Resident Fish, Subregion 4 1/

Waters	Angler-Days				
	Idaho	Nevada	Utah	Wyoming 2/	Totals
Streams	332,800	200	1,425	50,148	384,573
Lakes and Ponds	40,420	--	--	5,494	45,914
Reservoirs	232,015	--	800	33,228	266,043
Totals	605,235	200	2,225	88,870	696,530
				8,457 3/	8,457
				97,327	704,987

1/ 1965 estimates for Wyoming, 1966 estimates for Idaho, Nevada, and Utah.
2/ Includes Grand Teton National Park.
3/ Angler-days for Subregion 4 portion of Yellowstone National Park.



Fishermen prefer the many high quality streams. (Idaho Fish and Game Department)



CANADA
WASHINGTON
MONTANA
OREGON
IDAHO
CALIF.
NEVADA
UTAH
LOCATION MAP
Base Rev Oct 1969
MONTANA
IDAHO
CONTINENTAL
LEMHI
CLARK
FREMONT
ISLAND PARK
CUSTER
BUTTE
JEFFERSON
MADISON
BLAINE
CAMAS
ELMORE
GOODING
LINCOLN
JEROME
MINIDOKA
POWER
BINGHAM
BONNEVILLE
BANNOCK
CARIBOU
TWIN FALLS
CASSIA
ELKO
BOX ELDER
MACKAY RES.
Mud Lake
Rays Lake
Hamer
Dubois
St Anthony
Rexburg
Rigby
IDAHO FALLS
Shelley
Blackfoot
Arco
Ketchum
Sun Valley
Hailey
LITTLE WOOD RIVER RES.
FISH CREEK RES.
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Aberdeen
American Falls
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PORTNEUF RES.
LAKE WALCOTT
Rupert
Burley
MILNER DAM
Buhl
TWIN FALLS
SNAKE RIVER
CEDAR CREEK RES.
SALMON CREEK RES.
LOWER GOOSE CREEK RES.
IDAHO
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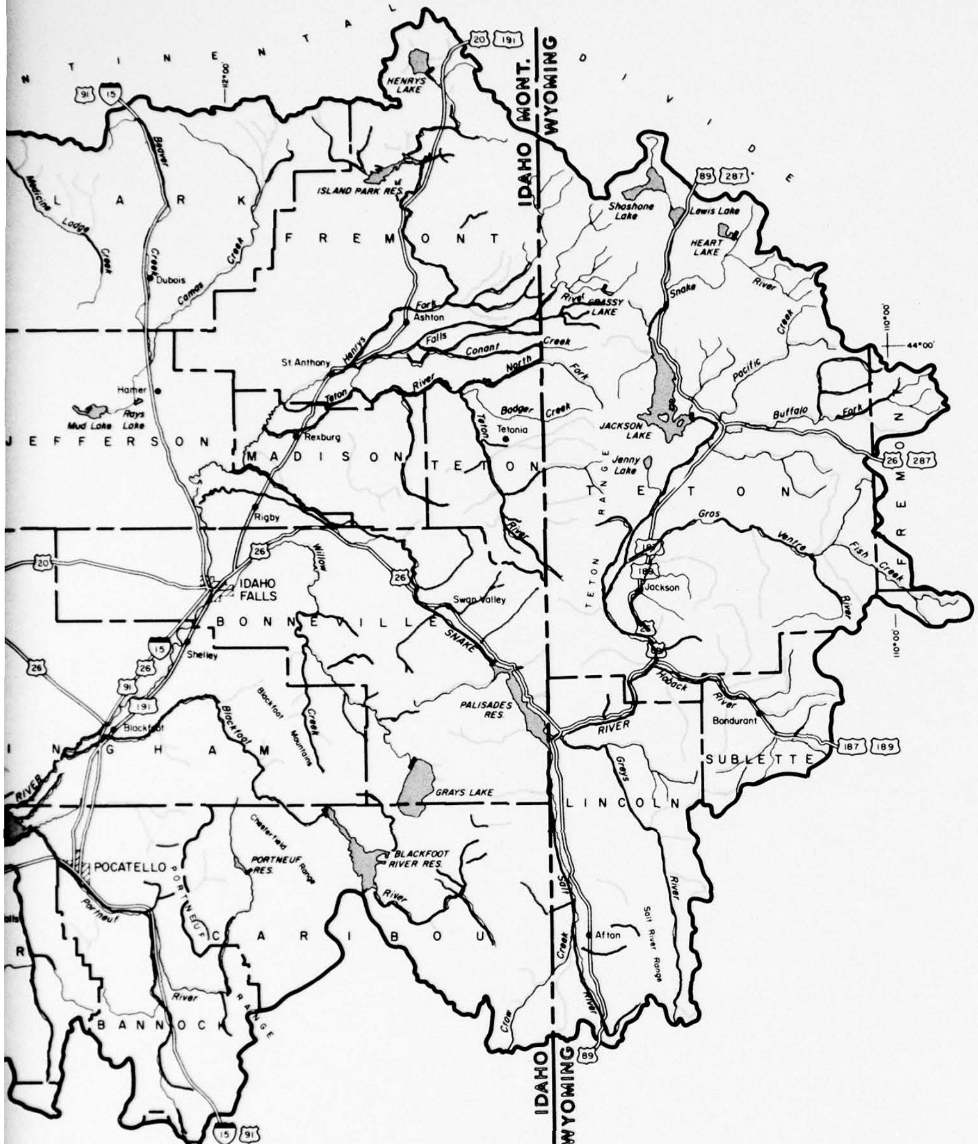
SCALE IN MILES



EXPLANATION

- Stream of nationwide importance
- Stream of statewide importance
- Stream of countywide importance
- Stream of local importance

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

CLASSIFIED FISHING STREAMS

UPPER SNAKE SUBREGION 4

1970

FIGURE 13

Factors Affecting Resource

Detrimental factors, which are chiefly physical, relate largely to uses of water or land in the watersheds for agriculture or other economic pursuits. Most important in this respect are irrigation diversion and dewatering operations. But channel alterations, flood control work, and various practices which result in drawdowns or fluctuations in available water also limit the fishery. Present watershed management practices such as overgrazing, improperly planned farming, poor irrigation practices, road and highway construction, logging, and at times local beaver activity, contribute to erosion, siltation, and turbidity. Willow removal for pasture development has weakened streambanks and exposed them to livestock trampling. A lack of streambank cover, together with abundant aquatic vegetation and high populations of rough fish, limit the fishery in many waters. Dikes along the Snake River have eliminated some nursery habitat.

High water temperatures detrimental to cold-water game fish occur in some impoundments and in segments of watercourses influenced by reservoir management. Oxygen deficiency is a problem at a few places, such as Market Lake in Idaho.

Industrial pollution damages the entire aquatic community. (Idaho Fish and Game Department)

Industrial and organic pollution on portions of the Portneuf and Snake Rivers has resulted in large fish kills. Nutrient additions to waters of the main Snake from industry, municipalities, and agriculture have promoted nuisance algae blooms in American Falls Reservoir. Plants processing sugar and potatoes add tremendous organic loads with high biochemical oxygen demand to the main Snake River. At Milner Reservoir downstream from Burley dissolved oxygen drops to critical levels during low flows in the winter months and often will not support fish life.

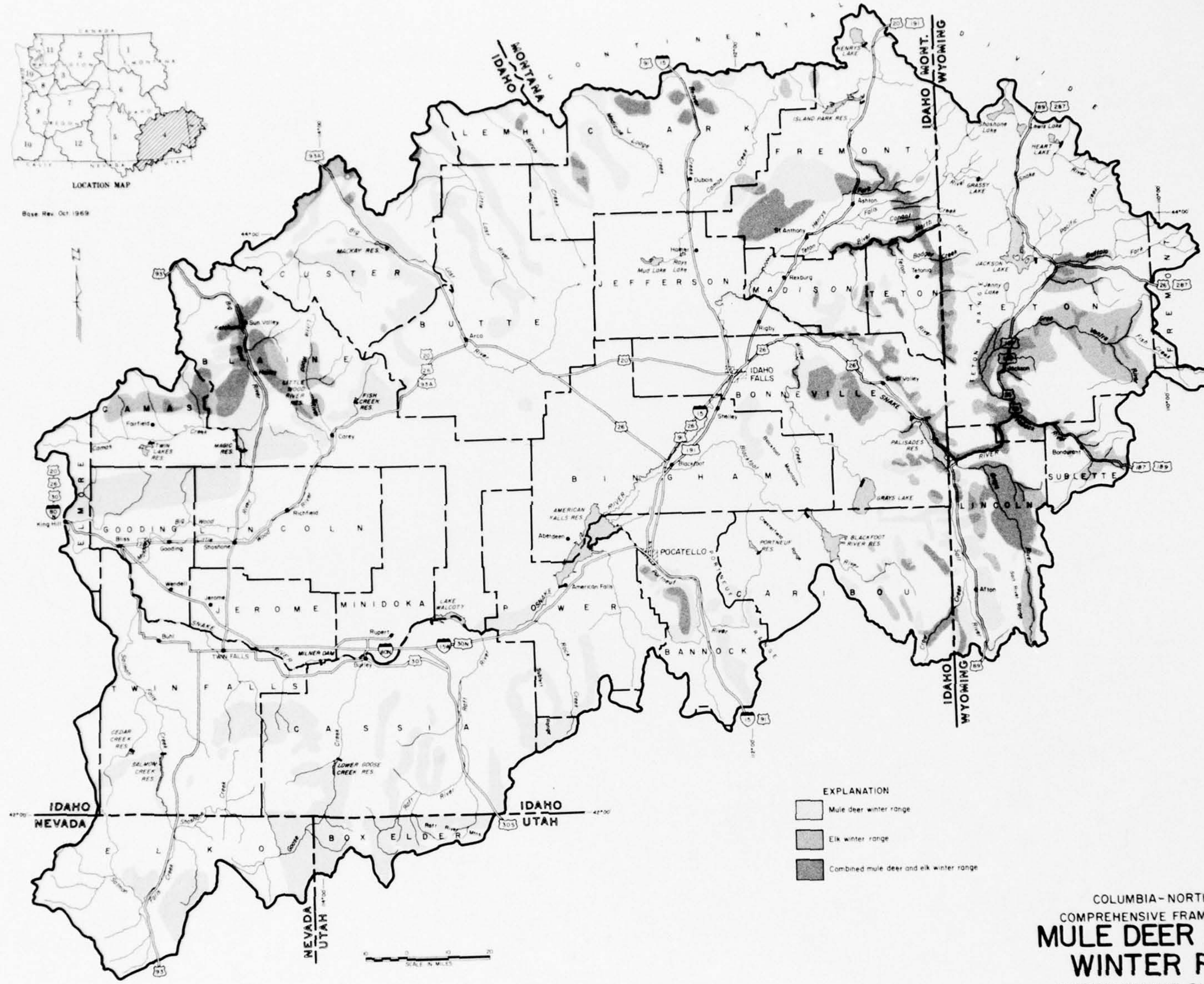
Lack of public access is a rather general problem on private lands as well as on Indian reservations. In some areas, even though there is considerable public land adjacent to the streams, access to these public lands is blocked by private landowners.

Beneficial developments and programs include rough fish control followed by stocking of suitable species, creating small impoundments specifically to provide a local fishery, providing public access to fishing areas, and introduction of species of fish new to the area. New species introduced locally include kokanee, coho salmon, brown trout, channel catfish, and smallmouth bass. Industrial and municipal pollution abatement is progressing in various areas.

Irrigation interests have favored the Snake River fishery by controlling Jackson Lake outflow during the summer season, thereby achieving a certain amount of channel stability. However, high summer water releases for irrigation purposes have in the past, and in a few recent years, created poor fishing conditions during the tourist season. Some local ranchers have become impressed by the need for access by fish to spawning areas as well as more or less silt-free resting and food-producing areas. Efforts have been made by several individuals to provide good passes at irrigation dams and to desilt stretches of small streams with earth-moving equipment.

In the year ending September 30, 1965, a total of 393,536 pounds of fish were stocked in waters of this subregion. Over 90 percent of the total poundage consisted of rainbow trout, but several other salmonid species were stocked in smaller amounts. Wyoming has no rainbow stocking program in its portion of the drainage, but stocks primarily cutthroat, with some lake trout and brook trout.

Developments on private lands, some of which contribute to the fish resource, include the farm ponds, fish ponds, and reservoirs listed earlier under "Habitat."



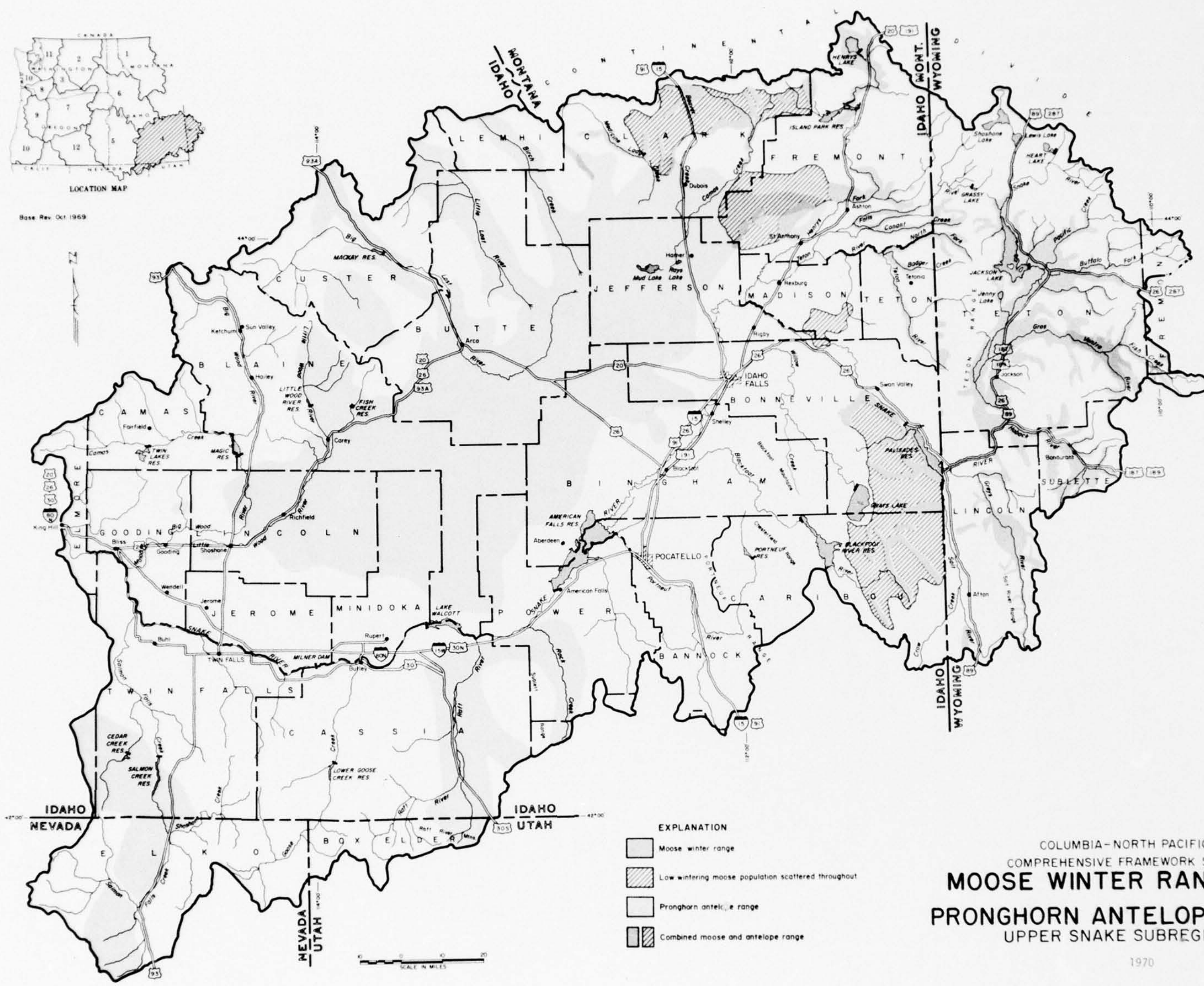
COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

MULE DEER AND ELK WINTER RANGES

UPPER SNAKE SUBREGION 4

1970

FIGURE 14



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

MOOSE WINTER RANGE AND PRONGHORN ANTELOPE RANGE

UPPER SNAKE SUBREGION 4

1970

FIGURE 15

Big Game

Big game species are elk, mule deer, white-tailed deer, moose, pronghorn antelope, bighorn sheep, mountain goat, black bear, and grizzly bear.

Habitat

Big game habitat varies from alpine growth in the high country down through dense coniferous forests to typical sagebrush-grasslands, interrupted by irrigated farmlands in the bottomlands and dry farm lands on some of the benches and foothills.

Figure 14 shows important range for mule deer and elk. Moose winter range and pronghorn antelope range are shown in figure 15. Maps are not included for the other big game animals. The range of some species of extremely limited distribution is indicated below. For other species, detailed information on seasonal distribution is not available.

Elk Elk are rather widely distributed, but inhabit mainly the timbered mountains. Much of the range is used jointly with deer; however, in some cases elk winter on high grassy, windswept ridges rather than drifting to lower elevations with the deer. A large portion of the historical winter elk range was taken over for man's use as the area was settled, and in Wyoming thousands of elk are now at least partially dependent upon feed grounds where natural forage is overused or no longer available. On the Upper Snake River plain in eastern Idaho a herd of about 1,000 elk winters with deer and moose in an open chokecherry-sage-bitterbrush range 20 miles out from the mountains in the vicinity of the Sand Creek Wildlife Management Area (figure 12).

The elk in the easternmost parts of this subregion generally have ample summer range, but there is considerable competition with livestock during the summer months in the remainder of the subregion. The summer range is generally the sub-alpine herblands between 5,000 to 10,000 feet in elevation. The elk move from native ranges and winter feed grounds, from short distances to as many as 70 air miles, to reach their summer ranges. Prominent summer range plant species are: tall larkspur, lupine, coneflower, mountain dandelion, aster, mountain brome, various grasses, cinquefoil, and other browse plants.

The native winter ranges include stream bottom areas and south facing slopes at lower elevations. Some of these areas are in private ownership which hinders their free use by game. For the most part, the elk have public lands upon which to range. The stream bottom vegetation consists of cottonwood, willow, silverberry, birch, blue grass, and big sagebrush. The south-facing mountain slopes and

canyons are covered with serviceberry, chokecherry, bitterbrush, aspen, rabbitbrush, blue bunch wheatgrass, and big sagebrush.

The Upper Snake River plain serves as essential winter range for many elk. (Bureau of Land Management)

Mule Deer Mule deer are numerous in all of the areas with suitable habitat. Across the south and east mountains there is an aspen-brush-evergreen association, with bitterbrush-sagebrush winter ranges. In much of the area immediately west of Yellowstone National Park, aspen is somewhat scarce but unbroken stands of lodgepole pine are quite common.

Mule deer generally inhabit all land up to about 10,000 feet in elevation, but the Upper Snake River plains are not good deer habitat. In some areas a definite migration occurs. Some deer travel up to 70 miles to reach certain winter ranges and they reverse this movement to return to summer ranges. The summer range areas are extensive and summering deer are widely distributed. Much of the summer range could support more deer than are present. The winter range, consisting of the bottomlands and south facing slopes at lower elevations, is the limiting factor of these deer herds. Deer densities are high on most of the winter ranges. Many of these ranges show evidence of overuse by livestock and deer.

Many south facing slopes are subject to livestock use, and elk also compete for the available browse in many areas. Forage species found on these wintering areas are serviceberry, chokecherry, aspen, bitterbrush, mountain mahogany, rabbitbrush, and sagebrush.

White-tailed Deer A few whitetails occur in deciduous timbered bottomlands along the Snake upstream from the mouth of Henrys Fork in Idaho. More than 60 were released in eastern Idaho in 1955 after being trapped in the Farragut area in northern Idaho.

Moose Moose are found throughout the timbered country in the northern and eastern parts of this subregion. They inhabit a variety of locations, from the traditional lily pad lakes in the area, to willow thickets along stream bottoms and high timbered ridges. Requirements for winter ranges are also varied, but cover of some type is believed essential. Records indicate that moose have actually increased in numbers as they have dispersed into various areas of available habitat. The stream bottom areas are dominated by cottonwood, willow, birch, spruce, fir, pine, and silverberry. The forest type used by moose includes fir, spruce, lodgepole pine, aspen, Ceanothus, and willow. Willow, chokecherry, and aspen are believed to be favored winter foods.

Pronghorn Antelope There are sizeable populations throughout the Upper Snake River plain, particularly north of the river. The heaviest concentrations are in Big and Little Lost Rivers, Birch Creek, Crooked Creek, and Medicine Lodge Creek drainages. These are high, dry, sagebrush valleys with irrigated farms along the lower streamcourses. Antelope here showed an upward population trend from about 1960 to 1966. Some of the higher valleys in the eastern part of the subregion are used by antelope in the summer but little at other times. Forage species found in the antelope areas are sagebrush, winterfat, rabbitbrush, bitterbrush, bluegrass, wheatgrasses, and various forbs.

Bighorn Sheep Bighorn sheep occur only in the eastern third of the subregion, in the higher and usually isolated terrain where cliffs and low shrub species predominate. Small populations occur at scattered locations, but several local ranges, such as the Gros Ventre Mountains, support substantial populations. Sheep generally spend the summer in the higher country, up to 11,000 feet. Movement to the winter range is more or less elevational, dictated by weather conditions. The winter range areas are south facing slopes and lowlands. The forage species present are sagebrush, rabbitbrush, winterfat, and mixed grasses.

Mountain Goat Mountain goat are found on the south end of the Lemhi range of mountains, along the northeast side of the Little Lost River Valley, and also in the southern extremities of the

Whitecloud range. These animals are found mainly on rugged peaks which offer a restricted amount of the specialized habitat they require.

Black Bear Black bear are fairly common in the wooded areas in all of the subregion except the southwestern parts. Local use in summer and early fall varies according to the success of the fruit crop. Much of the black bear area has extensive stands of lodgepole pine except on the north slopes where spruce and fir dominate. The area is characterized by numerous aspen stands which are often mixed in with the evergreen species. Above 8,000 feet in elevation, stands of limber pine furnish a food supply.

Grizzly Bear Grizzlies occur in Grand Teton and Yellowstone National Parks and adjacent lands of the Targhee and Teton National Forests, mainly at elevations from 7,000 to 11,000 feet. These limits are characterized with stands of lodgepole pine, spruce, fir, limber pine, and aspen. Many of the grizzly bear killed in this area are those which have migrated out of Yellowstone National Park.

Use

Estimated use of big game by hunters in 1965 totaled nearly 336,000 man-days. The distribution of this use is shown in table 34 for the various species.

Table 34 - Estimated Hunting Use of Big Game, Subregion 4, 1965[1/]

Species	Hunter-Days				
	Idaho	Nevada	Utah	Wyoming	Totals
Mule Deer	227,860	2,200	2,932	17,085	250,077
White-tailed Deer	--	--	--	--	--
Elk	32,410	--	--	43,564	75,974
Pronghorn Antelope	880	--	--	--	880
Moose	200	--	--	1,640	1,840
Mountain Goat	24	--	--	--	24
Bighorn Sheep	20	--	--	312	332
Black and Grizzly Bear	200	--	--	6,335	6,535
Totals	261,594	2,200	2,932	68,936	335,662

1/ Based on information from Idaho Fish and Game Department, Nevada Fish and Game Department, Utah Fish and Game Department, and Wyoming Game and Fish Commission.

This subregion affords special opportunities to hunt, observe, photograph, or study big game. This comes about not only because of the rugged terrain and the occurrence of so many different species of big game, but also because of the recognized value which has been given to wildlife by the various Federal agencies located within the area. In addition, Yellowstone and Grand Teton National Parks attract millions of visitors to the region each year. As with fishing in this area, big game is of national as well as local and State significance. The 1965 expenditures for big game hunting may be reasonably estimated to be in excess of $4,000,000. Intangible values would place the resource value much higher.

All big game species have some capacity for increased use. Most of this capacity is in deer hunting, and a much smaller part consists of elk hunting. Much of the available deer hunting is readily accessible locally but receives light hunting pressure because it is distant from the centers of human population.

Factors Affecting Resource

The limiting factor for big game in the subregion is the available amount of usable winter range. Much of the historic winter range is controlled by man for his use in raising crops or livestock. Encroachment upon big game winter range by recreationists, particularly those using snowmobiles, causes disturbance which is undoubtedly detrimental to big game in some areas. Periodic proposals for the construction of dams in the upper portion of the subregion invariably include sites which would flood existing winter ranges and elk feed grounds. Since winter range is limited now, any dams built in the future would be detrimental to big game.

Overgrazing, burning, and breaking of new land for farming are detrimental factors affecting big game. In recent years, farming has extended into elk range, and it has also taken rather extensive deer and antelope range. Competition between game and domestic livestock, and high populations of big game alone, have reduced the carrying capacity of many winter ranges. The widespread burning of range, purportedly to improve domestic sheep range, particularly north of Henrys Fork Snake River, has reduced winter range for elk, moose, and deer. Lack of deer and elk hunters in remote areas has resulted in big game populations maintaining their numbers without reaching their potential for net annual increase.

The lack of food, particularly berries, is the limiting factor for black bear. In addition, the increased use of the area by tourists and recreationists will place both black and grizzly bear in the nuisance category and those which cannot be moved or transplanted may be killed. Bear are currently classified as game animals, but they receive constant persecution, particularly in areas controlled by domestic sheep interests.

Special mention should be made concerning the grizzly bear, an endangered species, which still inhabits this subregion. Continuous persecution, plus sport hunting, has reduced the population over the years. In addition, cultivation and development of land have eliminated much grizzly bear habitat.

Acquisition and improvement of winter range, particularly for elk, have progressed with results which have raised the carrying capacity of the range in the vicinity of the Sand Creek Wildlife Management Area. Range improvement and management have included planting of various forage species, manipulating grazing by livestock, and exchange of land use to make additional browse on private and State lands available to elk. Trees and shrubs have been planted locally to provide permanent browse and seedings of grasses and legumes have been made. Wheat and barley have been seeded to hold elk on intermediate ranges to conserve critical area feed. Small patches seeded to wheat and barley have been useful in attracting elk toward good browse fields which have had little or no recent use by game.

Fencing has been used to exclude domestic stock from certain key wildlife areas, and experimental work has been done to reduce the competition to shrubs by permitting domestic livestock to graze the grass at selected periods.

In Wyoming the loss of historical winter elk range eventually leads to concentrations of elk in areas where heavy losses could be expected in severe winters because of the shortage of winter elk forage. The need for elk range brought about the establishment of the National Elk Refuge in 1913, and additions were made to the area later. The Wyoming Game and Fish Commission also maintains ten elk feeding areas within the drainage to supplement native winter range (figure 14). The use of these feeding areas by the elk depends upon the severity of the winter. These feeding areas have made elk available for trapping and transplanting to other ancestral areas within Wyoming and for research related to the management program.

Larger annual increases have been noted in elk wintering with unrestricted range than in feed ground situations. Hence, land use changes which restrict elk winter range must be considered detrimental to elk.

Cooperative range research and big game range development programs involving State and Federal agencies have been productive. These include the joint inspection of areas and planning of programs which will protect and improve the production of range forage while retaining wildlife habitat. Hunting seasons established on a factual basis have increased the public hunting opportunity and optimum forage production. Acquainting the public with the need for range

protection and development and related programs has been helpful to the progress of such work.

Upland Game

The species of upland game in Subregion 4 include ring-necked pheasant, chukar, Hungarian partridge, valley quail, blue grouse, ruffed grouse, sage grouse, sharp-tailed grouse, mourning dove, cottontail, and pigmy rabbit.

Habitat

Upland game habitat is extremely varied, from the semi-arid sagebrush plains and dense coniferous forests to the farmland habitat represented by crops, orchards, windbreaks, ditch banks, and roadside cover. Hence, the special requirements of the various species of upland game are best described separately. Figure 16 shows the general range of sharp-tailed grouse and sage grouse winter range and breeding grounds. Sharp-tailed grouse range is rather limited. Sage grouse range has received much attention in recent years because of the high place which sage grouse occupy as a game species and also because detailed information concerning the requirements of these grouse is desired for consideration when range use plans are made. Maps for the other upland game species are not shown, either because the range of the species is closely related to specialized habitat or land use (pheasant, e.g., live mainly in the irrigated agricultural areas) or because the information required is lacking.

Ring-necked Pheasant The ring-necked pheasant lives in and near the irrigated croplands, mainly in the central and western parts of this subregion. Pheasant occur in huntable numbers in the dry farm areas, only where such farms border irrigated lands since cover and water are generally lacking elsewhere.

Chukar Small populations of chukar occur in isolated niches in the Upper Snake River Valley but the species is severely limited by heavy snow conditions and lack of suitable rocky, grass-type terrain. On the western side of the subregion, good populations of chukar exist in the Bennett Range and on grassy foothill slopes adjacent to the Wood and Big Lost Rivers. The portion of these areas inhabited by chukar is moderately steep and the plant association is sagebrush-grass.

Hungarian Partridge This species is sparsely distributed throughout the subregion on irrigated croplands, on dry farm areas, and on grassy foothill slopes where the species overlaps habitat occupied by chukar. The best populations are on dry farm areas and in the grassy foothills of the subregion.

Valley Quail This species of quail occurs mainly along the Snake River from Minidoka Dam downstream. Although a few coveys occur in the irrigated tracts several miles from the river bottom, the largest populations are found close to the river where interspersion of brush and small grain crops best meets its living requirements. This species is very closely tied to watercourses.

Mountain Quail Only one area near the western boundary in this subregion has a good population of mountain quail. Here these birds exist in sagebrush-grass terrain along watercourses far from any timber.

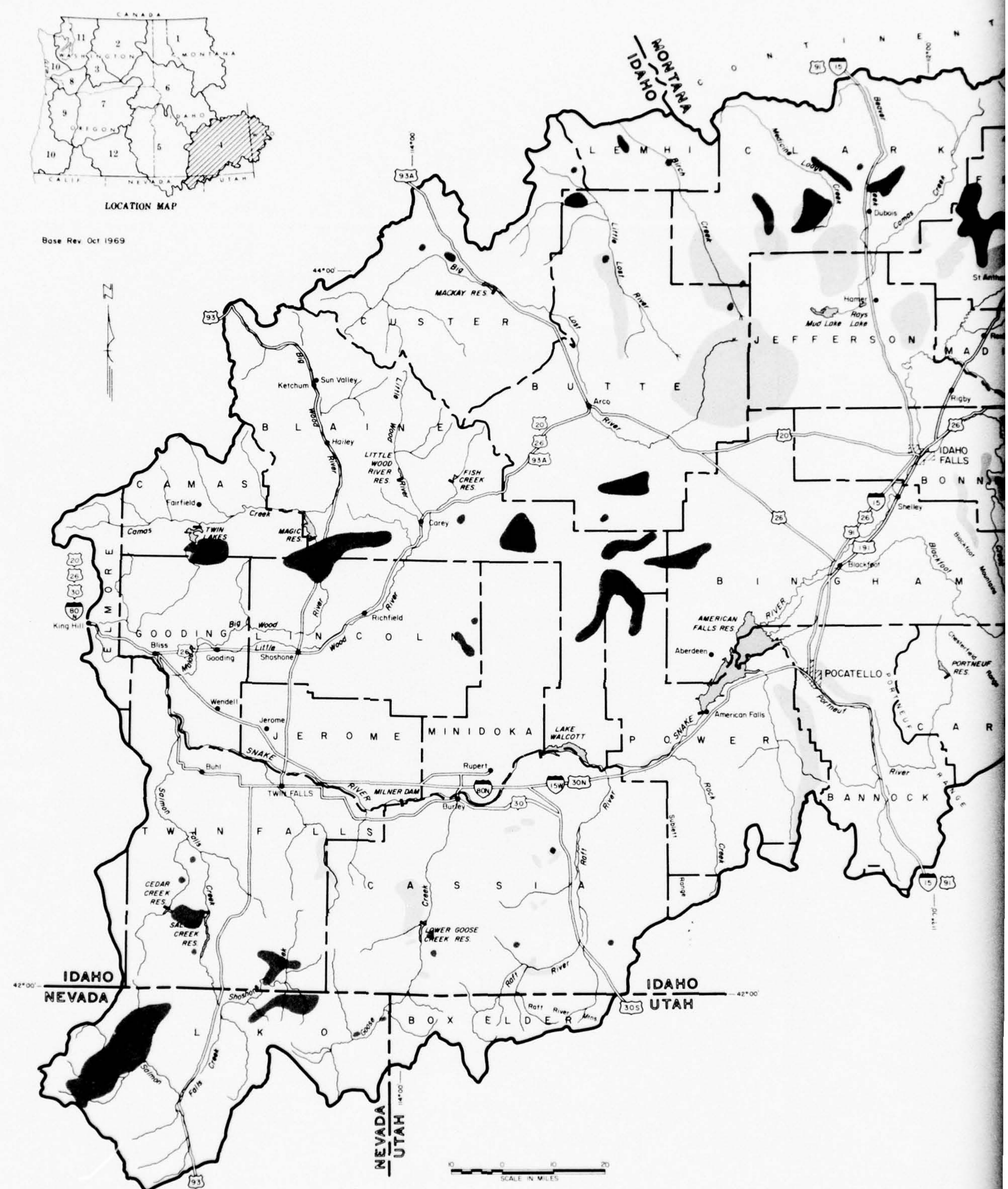
Ruffed Grouse Ruffed grouse occur in modest numbers in most of the forest lands of the subregion near water and wherever a mixture of deciduous and coniferous trees offer a good year-round food and cover situation. The species is most abundant around creeks and on the aspen benches in the lower elevation portion of the forests. It often follows willow-bordered shoestring creek habitat descending from the forests and is not uncommon along such creeks in the foothills at a considerable distance from the main forest type.

Blue Grouse Blue grouse, which occur in scattered populations in the more mountainous forest types of the subregion, spend fall and winter on higher slopes than the ruffed grouse but move down into the valleys in the spring for nesting and brooding. Blue grouse have a spotty distribution and are abundant in only a few areas.

Sage Grouse All of the sagebrush-grass habitat of the subregion has sage grouse, ranging in numbers from a very few to high populations. The Upper Snake River Plain in Clark and Fremont Counties in Idaho harbors the best remaining sage grouse populations. Sage grouse range seasonally from the low plains and valleys to moderately high mountain meadows, following the sagebrush type for cover and food enroute.

Sharp-tailed Grouse Several tiny relict populations of sharp-tail occur in southeastern Idaho, but the only one of huntable size is in southwestern Fremont County. Here, it inhabits the grassy terrain of the Juniper Buttes area and adjacent sand dunes, an area with a unique flora characterized by chokecherry, bitterbrush, and sage and with a variety of perennial grasses and forbs.

Mourning Dove The dove nests throughout the subregion, even in the lower forest types. Generally, it does not nest above 7,000 feet. While it is most abundant in the irrigated valleys, it occurs throughout the sagebrush plain also. It takes full advantage of any planted trees (windbreaks, orchards) for nesting, but these are not abundant in the area.



LOCATION MAP
CANADA
WASHINGTON
MONTANA
OREGON
IDAHO
CALIF
NEVADA
UTAH
Base Rev. Oct 1969
MONTANA
IDAHO
CONTINENT
LEMHI
CLARK
CUSTER
JEFFERSON
BUTTE
BLAINE
CAMAS
ELMORE
GOODING
LINCOLN
JEROME
MINIDOKA
BINGHAM
BONNEVILLE
POWER
BANNOCK
CARIBOU
TWIN FALLS
CASSIA
ELKO
BOX ELDER
MACKAY RES.
Mud Lake
Rays Lake
Hamer
Dubois
St Anthony
Rigby
IDAHO FALLS
Shelley
Blackfoot
Arco
Ketchum
Sun Valley
Hailey
Carey
LITTLE WOOD RIVER RES.
FISH CREEK RES.
Fairfield
TWIN LAKES
MAGIC RES.
Richfield
King Hill
Bliss
Gooding
Shoshone
Wendell
Jerome
Buhl
TWIN FALLS
MILNER DAM
Rupert
Burley
LAKE WALCOTT
AMERICAN FALLS RES.
Aberdeen
American Falls
POCATELLO
PORTNEUF RES.
SNAKE RIVER
CEDAR CREEK RES.
SALMON CREEK RES.
LOWER GOOSE CREEK RES.
IDAHO
NEVADA
UTAH
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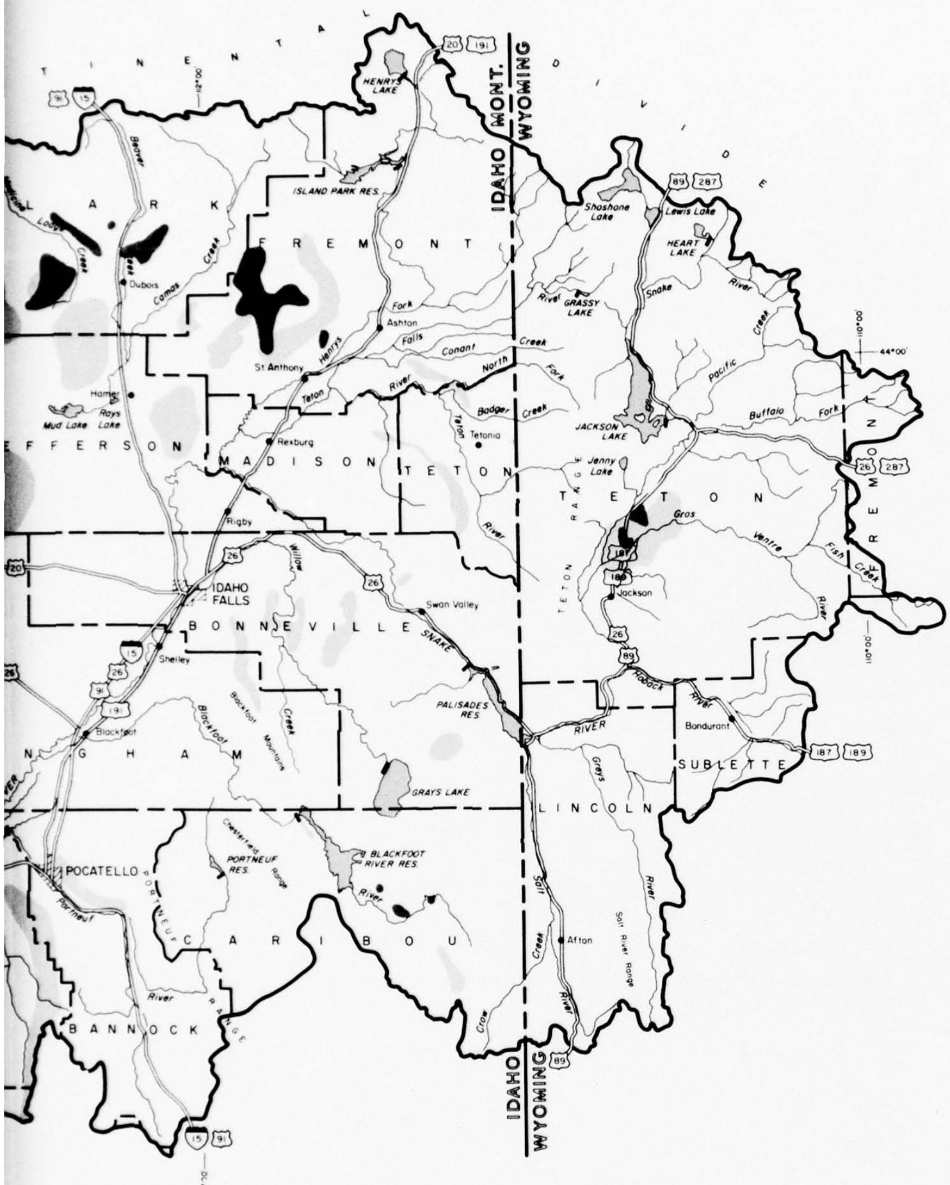
44°00'
SCALE IN MILES
10 0 10 20

2



EXPLANATION

Sharp – Tailed Grouse General Habitat

Known Breeding Area of Sage Grouse

Known Winter Habitat of Sage Grouse

COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

SHARP–TAILED AND SAGE GROUSE HABITAT

UPPER SNAKE SUBREGION 4

1970

FIGURE 16

Cottontail and Pigmy Rabbit The cottontail is sparsely distributed throughout the subregion at elevations below about 7,000 feet. It survives best in or adjacent to croplands but also is found scattered throughout sagebrush type wherever food, cover, and moisture conditions are suitable. The unique Idaho pigmy rabbit, smallest of the American rabbits, occurs in the southwestern portion of the subregion on the sagebrush plain in the more dense sagebrush types. It does not seem to occur to any extent on agricultural lands.

Use

The estimated use of upland game by hunters in 1965 was 348,000 man-days. Table 35 shows use for the various species.

Table 35 - Estimated Hunting Use of Upland Game, Subregion 4, 1965[1/]

	Hunter-Days				
Species	Idaho	Nevada	Utah	Wyoming	Totals
Ring-necked Pheasant	227,400	--	300	--	227,700
Chukar	12,800	900	500	100	14,300
Hungarian Partridge	10,800	200	1,200	200	12,400
Valley Quail	5,100	--	--	--	5,100
Mountain Quail	600	--	--	--	600
Ruffed Grouse	15,300	--	--	900	16,200
Blue Grouse	3,800	--	300	600	4,700
Sage Grouse	16,600	700	100	--	17,400
Sharp-tailed Grouse	500	--	--	--	500
Mourning Dove	25,000	--	2,000	--	27,000
Cottontail and Pigmy Rabbit	21,300	--	--	600	21,900
Totals	339,200	1,800	4,400	2,400	347,800

1/ Based on information from Idaho Fish and Game Department, Nevada Fish and Game Department, Utah Fish and Game Department, and Wyoming Game and Fish Commission.

The great variety in upland game makes this subregion very attractive to those interested in upland species. Few areas offer more variety, and the relatively low hunting pressure on most species results in high quality recreation for upland enthusiasts. About $1,700,000 was spent for upland game hunting in the subregion in 1965. Annual expenditures do not show the total resource value.

There is considerable capacity for increased use of all upland game species except mountain quail and sharp-tailed grouse, which have rather limited distribution. This capacity is more than double the current use.

Pheasant hunting makes up about two-thirds of the current hunter use of upland game and it will continue to bulk large in the future. However, the largest part of the capacity for increased use lies in other species which, in combination, could exceed even pheasant hunting in recreation potential. Remoteness and difficult access will doubtless keep use of some segments of this potential at a low level.

Factors Affecting Resource

Many of the detrimental factors, as well as the beneficial developments, affecting upland game are directly related to land use. There is a trend now among land managers toward giving positive consideration to upland game requirements when land use plans are made. The distance to which this trend will go will largely determine the future status of upland game.

Detrimental Factors As agricultural use of irrigated cropland intensifies, the subregion suffers continual loss of pheasant habitat. When a new irrigated tract is first farmed, it usually provides topnotch pheasant habitat with farming methods leaving lots of food and waste areas. As the tract matures, waste areas disappear, fields are farmed to the fences, and ditches are cleared of weeds. The severity of winter in part of the subregion, coupled with short growing seasons for crops, restricts the range of pheasant to elevations generally below 5,500 feet.

Heavy snow conditions in some parts of the subregion and lack of suitable rocky, steep terrain are the principal limiting factors for chukar.

Much of the valley plain is characterized by sagebrush type which does not appear to be optimum for Hungarian partridge. Also, water is deficient in much of the potential habitat. Heavy snow conditions in most of the dry farm country also appear to limit this species, although it persists in small numbers even there.

The two quail species which occur in the western part of the subregion are limited by scarcity of good brush, crop, and grass interspersion of their present range. Further east they are almost totally excluded by the heavy winter conditions that occur in some years.

Ruffed grouse are limited by absence of extensive and continuous mixed conifer-hardwood types. Some populations have decreased with the extension of farming to foothill areas which has eliminated aspen. Blue grouse have been adversely affected by long-term drought and heavy grazing on their lower nesting and brooding ranges. These factors have severely reduced cover quantity and quality of blue grouse production areas.

Sage grouse, already much reduced by elimination of sagebrush for croplands throughout the past century, are now experiencing an accelerated reduction of habitat through extensive sagebrush eradication programs both on public and private lands. In Clark County, Idaho, alone, during the past ten years about 125,000 acres of private sagebrush range have been converted to crested wheat grass. Similar programs on State and Federal lands have been proceeding at a rapid rate since 1950. On the national forest rangelands, key sage areas are often left in this sage-to-grass conversion to protect the sage grouse habitat. Sage grouse are almost completely dependent on sagebrush for food and cover.

With the advent of dry farming and heavy grazing, most of the prairie type of grassland is now gone from the subregion. The one remaining healthy population of sharp-tailed grouse is reasonably secure because the terrain it inhabits is unsuitable for farming.

Absence of free water in much of the sagebrush plains is undoubtedly the factor limiting mourning dove nesting. In the few cases where the *Idaho Fish and Game Department* has installed watering devices for other wildlife, high use of the water by mourning dove has followed immediately. Food also limits dove populations since they eat only seeds, including both crop and weed seeds.

The cottontail is limited by lack of good food and cover. The irrigated lands provide very little brush cover for nesting and escape sites. The dry farm areas lack year-round cover and water for rabbit.

Beneficial Developments Changes in land use which are detrimental to certain species of upland game sometimes create habitat favorable to other species. Most of the developments favoring upland game are related to irrigation and resultant land use changes. However, in some instances, related particularly to sharp-tailed grouse and sage grouse, land management programs are being developed to include wildlife habitat needs as a part of the overall plan. Several new irrigated tracts have been opened in recent years and some old ones enlarged. These tracts have added pheasant habitat which appears to balance somewhat the loss of quality which usually accompanies more intensive development of long-established irrigated tracts.

The utilization of lodgepole pine for pulp and posts in Fremont County, Idaho, in recent years has tended to open dense stands and appears to be favoring the ruffed grouse there.

Public land management agencies have recently indicated interest in the idea of adjusting their sagebrush eradication programs to leave some sage for wildlife. The State wildlife departments in Idaho and Wyoming have entered into cooperative agreements with the Bureau of Land Management and the U.S.D.A. Forest Service providing for joint review of all proposed brush eradication projects with a view to preserving sagebrush areas important to sage grouse and other wildlife.

The Idaho Fish and Game Department now controls some sharp-tailed grouse range in the Sand Creek Wildlife Management Area and through land use trades in the vicinity. Curtailment and control of livestock grazing and minimal development programs have already resulted in considerable improvement of the area as wildlife habitat. Additional improvements and management of the area primarily for the benefit of wildlife will enhance the habitat for sharp-tail and other wildlife.

Dove are believed to be secure because agricultural lands are expanding with new irrigation projects which provide additional nesting, feeding, and watering situations.

Fur Animals

Fur animals in this subregion are badger, beaver, bobcat, coyote, lynx, marten, mink, muskrat, nutria, otter, raccoon, red fox, spotted skunk, striped skunk, weasel, and wolverine. Fur from white-tailed jack rabbit, black-tailed jack rabbit, snowshoe rabbit, and mountain lion also enters the fur trade. From the standpoint of numbers of pelts taken and total economic value, beaver, bobcat, coyote, mink, muskrat, and red fox were more important in 1965-1966 than the other animals listed.

Habitat

Fur animals occur throughout the subregion. Beaver, muskrat, and mink are found along most streams, lakes, and ponds. They are abundant mainly in the eastern part of the subregion. The widely distributed fur animals which live away from water are the badger, bobcat, coyote, spotted skunk, striped skunk, and weasel. River otter occur in the more remote and permanent mountain streams. Nutria have been introduced and occur in limited numbers as wild animals in some localities. Red fox are common in the eastern part of the subregion. Lynx and marten are limited to the higher timbered parts in the northern and eastern mountains. Raccoon are

common along stream courses, especially in the western lowlands. Wolverine are very scarce.

Use

In the 1965-66 trapping season an estimated 50,549 pelts were taken. Very little trapping pressure is currently exerted upon most furbearers with the exception of beaver, bobcat, mink, and muskrat. These four species made up about 97 percent of the pelts trapped in 1965-66. The furbearers as a group could produce considerably more fur than is now being marketed annually. Some species discussed as furbearers also provide recreational hunting.

In the 1965-66 trapping season the Idaho portion of the subregion yielded approximately 49,800 pelts, which included about 45,000 muskrat, 2,600 beaver, 700 mink, 400 bobcat, and smaller numbers of at least eleven other species, but mainly red fox, raccoon, striped skunk, weasel, and coyote. Wyoming fur yields in the 1965-66 season totaled fewer than 800 pelts which included approximately 205 beaver, 216 coyote, 180 marten, and only 153 mink, bobcat, fox, and badger, combined. About 30 beaver are taken annually in northwestern Utah. Muskrat are not classified as furbearers in Utah and otter are protected in Wyoming. Trapping of furbearers is negligible in northeastern Nevada. Bobcat and coyote are taken by methods other than trapping, but the extent of this use in the subregion is not known.

Based upon Idaho trappers reports and Wyoming estimates, the market value for furs taken during the 1965-66 trapping season was approximately $106,100. Until relatively recent times, most of the trapping pressure was on beaver, mink, and muskrat. However, in recent years bobcat pelts have taken a prominent place in the fur market. In this subregion the total value of bobcat pelts taken by trappers in the 1965-66 season was exceeded only by that for muskrat and beaver.

Besides their commercial value, furbearers have wide esthetic appeal and their presence affords great opportunity for educational and scientific purposes in demonstrating principles of ecology to the public. The pleasure which people derive simply by observing wild animals in their natural surroundings probably represents the greatest importance of the fur animals and other nongame animals. As an example, people vacationing in this subregion have an exceptional opportunity to see beaver. This certainly heightens the outdoor experience of fishermen, hunters, and sightseers.

The human benefits to be gained from nonhunting wildlife use provide one of the important reasons why land and water use plans should provide for the maintenance of a diverse and productive

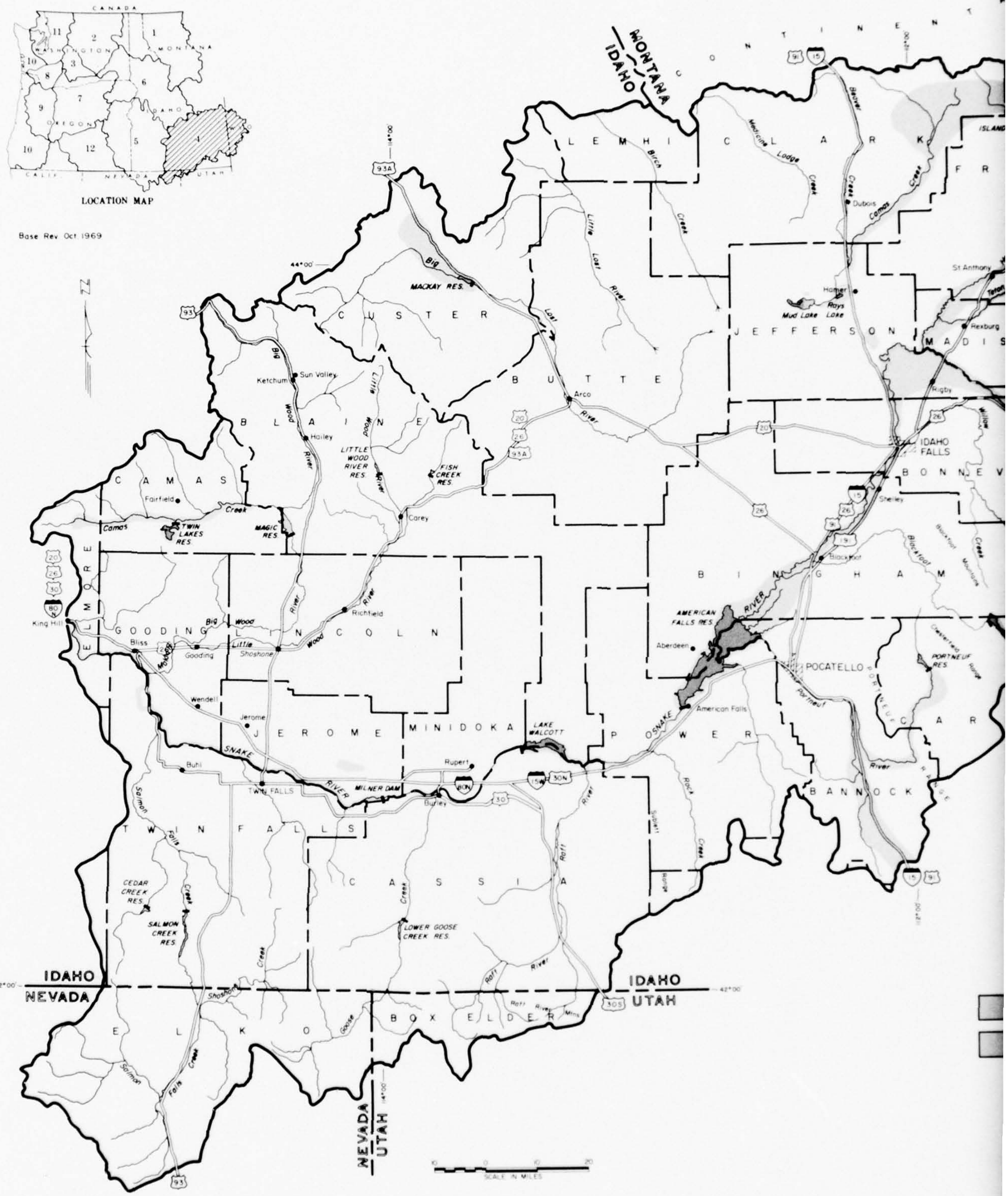
The beaver, fur animal of many values. (Oregon State Game Commission)

natural habitat. Destruction of habitat or elimination of a species of animal represents greater loss than shown by tables of economic value alone.

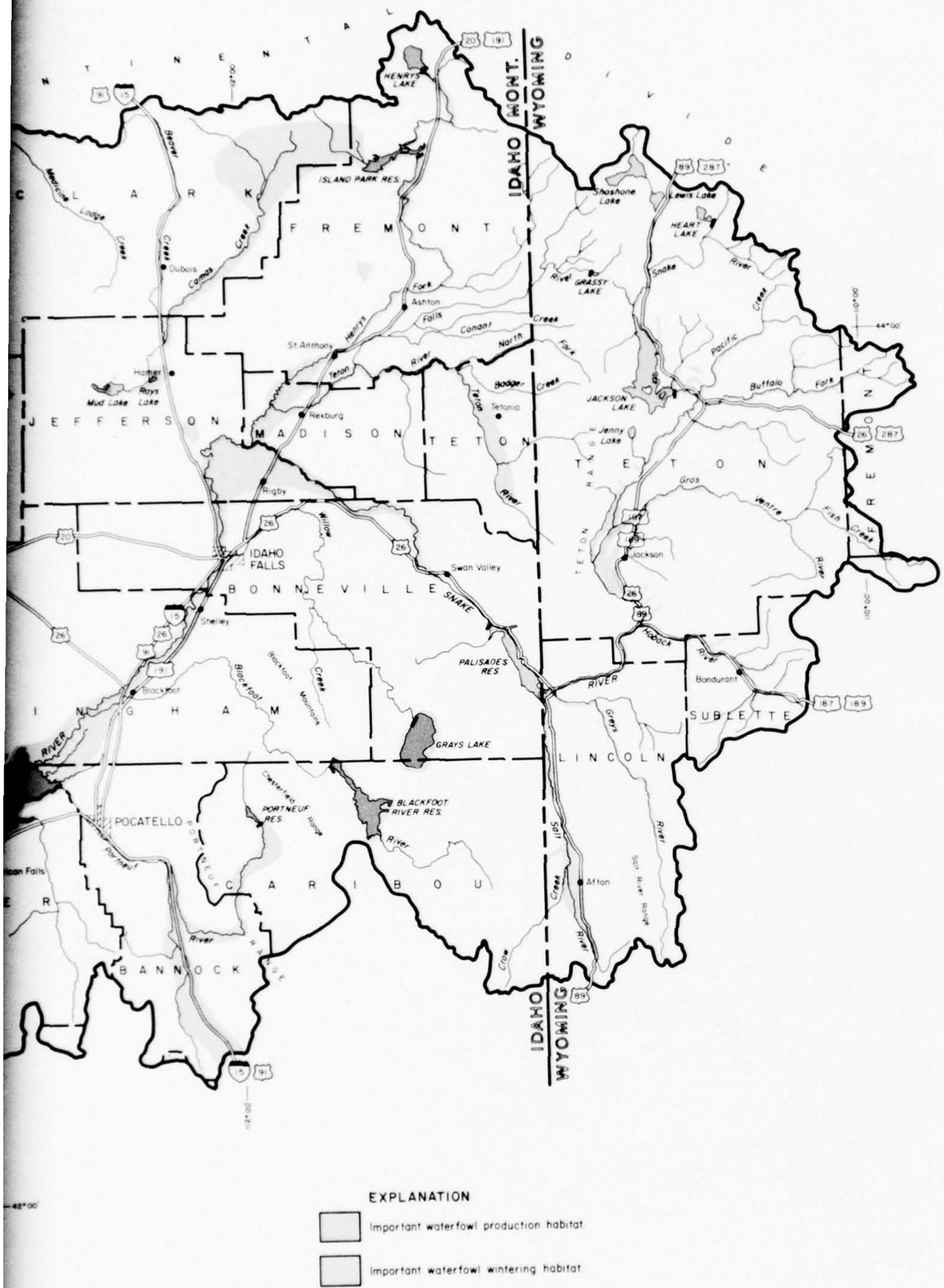
Factors Affecting Resource

Removal of streamside cover, brush, and old trees, draining or filling of natural wetlands, overgrazing, and the general clean farming practices on agricultural lands have combined to reduce the total habitat available to furbearers. Pest control programs and improper use of rodenticides and insecticides undoubtedly have been detrimental to furbearers in many instances, but the effects of such operations have usually not been understood nor carefully evaluated. In many areas of the subregion, domestic, agricultural, and industrial pollution of streams and rivers has reduced furbearer populations.

A steady decline of trapping activity since about 1950 has resulted because of changes in economic conditions, including the modern mode of life as well as depressed prices for all furs.


LOCATION MAP
CANADA
WASHINGTON
MONTANA
IDAHO
OREGON
CALIF.
NEVADA
UTAH
Base Rev Oct 1969
MONTANA
IDAHO
CONTINENTAL
LEMHI
CLARK
CUSTER
BUTTE
JEFFERSON
MADISON
BLAINE
CAMAS
ELMORE
GOODING
LINCOLN
JEROME
MINIDOKA
POWER
BINGHAM
BONNEVILLE
BANNOCK
CARIBOU
TWIN FALLS
CASSIA
ELKO
BOX ELDER
MACKAY RES.
LITTLE WOOD RIVER RES.
FISH CREEK RES.
TWIN LAKES RES.
MAGIC RES.
AMERICAN FALLS RES.
LAKE WALCOTT
MILNER DAM
CEDAR CREEK RES.
SALMON CREEK RES.
LOWER GOOSE CREEK RES.
PORTNEUF RES.
Mud Lake
Rays Lake
SNAKE RIVER
Big Lost River
Big Wood River
Little Wood River
Camas Creek
Birch Creek
Medicine Lodge Creek
Beaver Creek
Raft River
Salmon Falls Creek
Ketchum
Sun Valley
Hailey
Carey
Fairfield
Arco
Richfield
Shoshone
Gooding
Bliss
King Hill
Wendell
Jerome
Buhl
Twin Falls
Rupert
Burley
American Falls
Aberdeen
POCATELLO
Blackfoot
Shelley
IDAHO FALLS
Rigby
Rexburg
St Anthony
Dubois
Hamer
IDAHO
NEVADA
IDAHO
UTAH
NEVADA
UTAH
SCALE IN MILES

2



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

IMPORTANT WATERFOWL HABITAT

UPPER SNAKE SUBREGION 4

1970

FIGURE 17

Waterfowl

Most species common to the western United States are found in the subregion at various times of the year. Canada geese, mallard, gadwall, pintail, baldpate, blue-winged teal, cinnamon teal, and redhead duck are the principal nesting species. Large numbers of mallards and some Canada geese winter along certain sections of the Snake River. Trumpeter swan, an endangered species, are year-round residents.

Habitat

Figure 17 shows the important production and wintering habitat for waterfowl. The main production areas for ducks in this subregion are (1) in Jefferson County (Mud Lake-Camas National Wildlife Refuge-Market Lake), (2) in Caribou County (Grays Lake and Blackfoot Reservoir), (3) in Bannock County (Fort Hall bottoms), and (4) at Lake Walcott (Minidoka National Wildlife Refuge). There are numerous other areas which produce small to moderate numbers of ducks, but the subregion has very little pothole duck production of the type for which the Canadian prairies are famous. Most of the production is associated with creeks, wet meadows, rivers, reservoirs, large marshes, and irrigation canals. Nevertheless, this subregion contains most of Idaho's wetland habitat. A considerable portion of the wetlands is under Federal or State control either on refuges, management areas, or recreational reservoirs.

Several major migration and wintering areas for ducks are provided mainly by the large irrigation reservoirs and the Snake River. In this subregion such areas are used mainly as migration stopping points with most ducks going south or downriver into southwestern Idaho to winter. Modest numbers of wintering mallards can be found scattered throughout the subregion in places where open water is available in winter.

The subregion provides production habitat for a large segment of the Intermountain Canada goose flock which filters south in the Pacific Flyway through Utah and Nevada in the fall to winter in south-central Arizona and the Imperial Valley and Riverside areas of California. The main goose production units in the subregion are Island Park Reservoir, Henrys Fork of the Snake River, Mud Lake-Camas National Wildlife Refuge area, Grays Lake, Blackfoot Reservoir, Teton Basin, the Snake upstream from Henrys Fork, Minidoka National Wildlife Refuge, and Mormon Reservoir in Camas County.

The large reservoirs serve as concentration points for the fall Canada goose migration as well as for a limited amount of wintering for Canada geese. These reservoirs are Island Park, American Falls, Blackfoot, and Lake Walcott. The two main wintering spots for Canada geese are the Henrys Fork of the Snake River and American

Falls Reservoir. The only other goose species of any consequence here in the fall of the year is the snow goose. An estimated 40,000 snow geese pass through each October and continue on a more or less direct route into the Utah marshes, thence to California.

Use

The annual hunter use of waterfowl is shown in table 36.

Table 36 - Estimated Annual Hunting Use of Waterfowl, Subregion 4[1/]

	Hunter-Days				
Waterfowl Group	Idaho	Nevada	Utah	Wyoming	Totals
Ducks	113,800	--	100	4,900	118,800
Geese	48,500	--	--	3,800	52,300
Coot	5,000	--	--	--	5,000
Totals	167,300	--	100	8,700	176,100

1/ Based on 1966 data from Idaho Fish and Game Department, and 1965 data from Wyoming Game and Fish Commission and Utah Fish and Game Department.

In 1965 hunters spent slightly over $1,100,000 for waterfowl hunting. Goose hunting opportunity in the Upper Snake Subregion is particularly attractive. Annual expenditures do not show the true resource value, but are simply one indication of the importance of the resource.

The Upper Snake Subregion includes the Island Park area which is one of the most important wintering districts for trumpeter swan in the conterminous United States. The subregion also includes other vital winter habitat for trumpeter swan in the National Elk Refuge and in Yellowstone National Park.

Waterfowl are managed on a flyway basis which involves interstate and international cooperation. There may be some waterfowl species for which additional harvest may be desirable. However, any estimate of capacity for increased use locally would probably be dependent upon use or projected use in other parts of the flyway. Hence, no estimate of the capacity for increased use will be made in this appendix.

Factors Affecting Resource

Detrimental factors for waterfowl include occasional seasonal flooding of nesting habitat. Some of this flooding occurs when flow fluctuations result from untimely releases from storage projects.

Grazing is sometimes detrimental to waterfowl production, but properly planned grazing can be useful in waterfowl habitat management. Examples of both detrimental and beneficial grazing practices are found in this subregion in relation to waterfowl. Destruction of nesting habitat on islands and stream borders through farming or grazing is common.

The Bureau of Sport Fisheries and Wildlife manages three waterfowl refuges which provide habitat and protection to waterfowl and also furnish public hunting, fishing, and other outdoor recreation. The Idaho Fish and Game Department operates five wildlife management areas which contain waterfowl habitat and provide hunting.

Farm ponds, fish ponds, and irrigation storage reservoirs mentioned earlier under resident fish habitat, probably provide some useful waterfowl nesting habitat but this has not been evaluated. The value of these water areas for waterfowl nesting is largely dependent upon management of the shoreline and nearby cover.

Other Wildlife

Many other kinds of wildlife are found in the Upper Snake Subregion. Two rare species of birds, the greater sandhill crane and the American peregrine falcon, breed here. One of the two largest nesting concentrations of greater sandhill crane in the United States is found here. Shorebirds are seasonally abundant, and bald eagles commonly winter near the larger streams and reservoirs. Resident species whose population status is still undetermined nationally are the ferruginous hawk, American osprey, and prairie falcon. There is special interest in the mountain lion which occurs in some of the mountainous areas. Marmot and jack rabbit, and hundreds of other wildlife species are of some importance. These include various rodents and song, insectivorous, and rodent-killing birds. These, and all other kinds of wildlife, have definite but often undocumented requirements. The variety of wildlife, including both game and nongame species, which occurs in this area is certainly one of the outstanding attributes of the subregion.

Hunting use data on other wildlife are not available. However, such use is estimated to be less than 10 percent as great as hunting for game species.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

Changes which are expected in urban and industrial growth and agricultural expansion will have pronounced effects upon fish and wildlife habitat. The Upper Snake Subregion will probably see greater changes than the region as a whole, mainly because the land and water resources here are especially attractive to urban, industrial, and agricultural growth.

Satisfying future fishing and hunting needs will require extensive programs integrated with the other uses of land and water.

Fishing

Research in Idaho and Wyoming indicates a significant preference for stream fishing by both resident and nonresident fishermen. The 1966 Idaho Fisheries Habitat Inventory showed that although streams provided only 22 percent of the available water area, they supported 56 percent of the fishing pressure and that 65 percent of Idaho's 370,000 fishermen preferred stream fishing. The Wyoming study, for the Snake River drainage only, showed that 53 percent of Wyoming's 40,819 fishermen in this drainage preferred stream fishing. Reservoirs have already flooded out over 600 miles of streams in Idaho. By the year 2000, proposed dam construction could eliminate 19 percent of Idaho's 1965 stream acreage, reducing stream acreage within the subregion by 7.5 percent. At the present time there is no dam construction scheduled for the Wyoming portion of the subregion; however, history shows that numerous dam construction sites, which could eventually destroy the last remnants of native trout stream fisheries, have been proposed. Major dam construction in Wyoming could not only destroy the stream fishery, but in addition it could also eliminate wildlife winter range, already in critical supply. Thus, protection and enhancement of existing stream fisheries is perhaps the foremost problem facing Idaho and Wyoming today.

Stream protection legislation is vitally needed to provide control and guidance over the present operations of individuals and agencies which are altering stream channels for flood control, mining, and road building. Minimum flows should be established for all streams, with fishing and recreation given legal recognition as beneficial uses of water. Many stream sections could be greatly enhanced with a guaranteed minimum flow year-round.

Fish ladders should be constructed when feasible at any existing dams which are barriers to fish movements, and fish screens should be installed at diversion works when desirable. Spawning channels should be constructed at several locations downstream from dams to increase trout populations.

Probably the worst industrial pollution problems in the subregion, as well as in the entire State of Idaho, occur in the Snake River and smaller tributaries above King Hill. Effective enforcement of water quality standards as established by the Idaho Board of Health could, in time, correct this situation.

Attempts to establish self-sustaining runs of both early and late spawning kokanee in a number of the larger irrigation reservoirs will be continued. This will be coupled with rough fish control programs wherever feasible. Other new species have been and will be introduced into suitable environments to provide additional fishing. Species now included in this introduction program are kokanee, coho salmon, channel catfish, smallmouth bass, and brown trout.

As fishing pressure continues to increase, efforts to purchase or lease areas to provide access to fishing waters should be accelerated. Over 41 percent of the Idaho stream mileage in the subregion is all or partly bordered by private lands. Public access needs are proportionately greater near population centers. While 59 percent of the stream mileage flows through Federal lands and is accessible to the fishing public, it should be recognized that these figures include many small mountain streams which are relatively unproductive. Larger, more productive streams are generally found in the valleys associated with agricultural development and private lands. With the exception of the Salt River and approximately 12 miles of the Snake River, the majority of the streams in Wyoming are bordered by public lands. In the past few years an accelerated purchase or easement program was initiated on the aforementioned rivers. This program has provided over 21 miles of public fishing areas on these two rivers.

Habitat Preservation

Maintaining quality fishing for the future will require preservation of stream habitat. Hence, the following streams should be retained in their present state in the interest of resident fish:

Snake River from Yellowstone National Park to Jackson Lake, from outlet of Jackson Lake to Palisades Reservoir, and from Palisades Dam to Big Burns Canyon
Salt River
Greys River
Little Greys River

Hoback River
Granite Creek
Gros Ventre River
Buffalo Fork River, in Wyoming upstream from Turpin Meadows
Henrys Fork and tributaries, upstream from St. Anthony
Falls River, from origin to confluence with Henrys Fork
Teton River and tributaries, upstream from Teton station
Blackfoot River and tributaries, upstream from Blackfoot Reservoir
Portneuf River, upstream from Lava Hot Springs
Snake River, upstream from American Falls Reservoir to Ferry Butte
Spring Creek, downstream from Ferry Butte
Snake River, from American Falls to Lake Walcott
Rock Creek, in Twin Falls County
Snake River, from Shoshone Falls to Thousand Springs
Medicine Lodge Creek
Silver Creek
Big Wood River and tributaries
Little Wood River
East Fork Big Lost River and tributaries, in Copper Basin
Summit Creek, upper tributary of Little Lost River
Big Spring Creek, tributary of Little Lost River
Birch Creek, upstream from Blue Dome
Big Lost River and tributaries, downstream from Mackay Reservoir
Canyon Creek, upper headwaters of Salmon Falls Creek, in Nevada
Camp Creek, upper headwaters of Salmon Falls Creek, in Nevada
Cottonwood Creek, upper headwaters of Salmon Falls Creek, in Nevada
Jake's Creek, upper headwaters of Salmon Falls Creek, in Nevada
Sun Creek, upper headwaters of Salmon Falls Creek, in Nevada
Shoshone Creek, upper headwaters of Salmon Falls Creek, in Nevada
Salmon Falls Creek, upper headwaters of Salmon Falls Creek, in Nevada
Pine Creek, Goose Creek drainage, in Nevada

Most of the fishing streams in the Nevada portion of the subregion are on public domain lands. It will be advantageous to keep these lands in public ownership and assure the multiple use principle. White sturgeon habitat in Idaho should be preserved to save this endangered species.

Table 37 lists water requirements for providing minimum flows for fish and wildlife at selected points.

Table 37 - Minimum Flows for Fish and Wildlife at Selected Points,[1] Subregion 4

Stream	Points	Minimum Flow (cfs)
Snake River	Jackson Lake Outlet	300
Salt River	Mouth	370
Crow Creek	Mouth	30
Snake River	Irwin (State line)	1,000
Snake River	Heise	1,000
Henrys Fork	Ashton	500
Fall River	Squirrel	300
Conant Creek	Mouth	10
Squirrel Creek	Mouth	5
Henrys Fork	St. Anthony	1,200
Teton River	Driggs	100
N. Fk. Teton River	Mouth	50
Teton River	St. Anthony	300
S. Fk. Teton River	Mouth	50
Teton River	Mouth	350
Henrys Fork	Rexburg	1,200
Snake River	Shelley	1,000
Blackfoot River	Little Indian Canal	50
Portneuf River	Chesterfield Dam	25
Portneuf River	Downstream from Downey Canal	30
Snake River	Neeley	1,000
Rock Creek	Mouth	10
Raft River	Mouth	15
Snake River	Milner	1,000
Snake River	Shoshone Falls	1,000
Snake River	Near Crystal Springs	2,000
Snake River	Upper Salmon Falls	5,000
Salmon Falls Creek	Salmon Falls Dam	50
Big Wood River	Hailey	100
Camas Creek	Near Blaine	75
Big Wood River	Downstream from Richfield Div.	100
Big Wood River	Gooding	100
Snake River	King Hill	6,000
North Tributaries		
Beaver Creek	Spencer	10
Camas Creek	Hamer	10
Medicine Lodge Creek	Small	15
Birch Creek	Downstream from Blue Dome	75
Little Lost River	Howe	20
Big Lost River	Mackay	50

1/ Points represent sites where water development may affect streamflows. Based upon data supplied by Wyoming Fish and Game Commission, Bureau of Sport Fisheries and Wildlife, and Idaho Fish and Game Department (Aquatic Life Water Needs in Idaho Streams, IWRB - Planning Report Number 3, Boise, Idaho; 1969.).

Habitat Improvement

Improvement of habitat for resident fish in the Upper Snake Subregion could be achieved by treating wastes from industrial and domestic pollution, controlling erosion, maintaining streamflows, and by making structural improvements in the streambeds. In addition, new habitat could be developed by constructing new fishing lakes where they would not be detrimental to existing fish and wildlife resources. A 550 surface-acre fishing lake on Spring Creek (Salt River tributary) in Idaho is proposed. Increased flows should be provided in those streams where present flows are insufficient to maintain quality fisheries. Dam releases required for optimum water temperature and flow volume should be cooperatively determined. Adequate conservation pools should be provided in those reservoirs which are subject to severe drawdown. Construction of subimpoundments will be desirable on some fluctuating reservoirs.

Projected fish habitat improvement means by Federal and non-Federal agencies are shown in table 38. Plans for non-Federal habitat improvement means are incomplete, and some tentative plans undoubtedly overlap some of the Federal plans. The extent of this overlap is not known. Measures in the table proposed by non-Federal agencies include those mentioned below.

Habitat improvements proposed by the Idaho Fish and Game Department by 1980 include structural improvements in 29 miles of streambeds in six stream reaches in the Portneuf and Blackfoot River drainages and creation of two new fishing lakes in Elmore and Caribou Counties. Cost estimates for these improvements and their maintenance are not available. Likewise, cost estimates are not available for needed secondary treatment of wastes, erosion control, nor restoration or maintenance of streamflows.

The installation of a fish barrier to prohibit upstream migration of rough fish in Salmon Falls Creek, Nevada, would increase fishing considerably. Cost for the project is estimated at $21,000.

Wyoming has a minimum number of habitat improvements under consideration; however, cost estimates have not been developed. These improvements include (1) streambank revegetation and stabilization of eroded banks on the Salt River; (2) obtaining minimum flows for fisheries through a reach of the Gros Ventre River that is now being dewatered; and (3) possibility of reopening Spring Creek channels on Snake River which were closed by flood control dikes.

Control of undesirable fish populations should be accomplished in about 200 miles of streams and in Blackfoot and Palisades Reservoirs.

Table 38 - Fish Habitat Improvement Means, Subregion 4

Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Stream improvement	mile	210	218.0	270	281.0	270	281.0
Spawning bed improvement	mile	50	67.5	47	63.5	73	98.6
Rough fish removal (streams)	mile	88	.2	98	.2	98	.2
Rough fish removal (lakes)	acre	0	0	5,000	5.0	5,000	5.0
Stream channel preparation	mile	30	30.0	69	279.5	25	225.0
Lake improvement	acre	740	370.0	950	475.0	950	475.0
Sub-totals			685.7		1,104.2		1,084.8
Planning							
Fish stream surveys	mile	1,030	21.0	Not available		Not available	
Fish lake surveys	acre	5,090	25.0	Not available		Not available	
Sub-total			46.0				
Total			731.7				

Non-Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Structural improvements in streambeds	mile	29	60	--	--	--	--
Fish lakes (2)	acre	810	450	--	--	--	--
Revegetate and stabilize streambanks	mile	100	375	60	225	--	--
Barriers to rough fish	each	1	21	--	--	--	--
Fish ladders and screens	each	--	100	--	40	--	--
Sub-totals			1,006		265		--
Planning							
Fish stream surveys	mile	3,090	62	Not available		Not available	
Fish lake surveys	acre	10,000	50	Not available		Not available	
Sub-total			112				
Total			1,118				

Greater Harvest

Much of the Upper Snake River Subregion could support additional fishing pressure and harvest without serious reduction in fishing quality. Lowland reservoirs of this subregion have high fish production. Some streams are lightly fished because of poor accessibility, isolation, and general lack of familiarity with the area by fishermen. Access should be provided to fishing areas on public lands which are presently controlled by adjacent private land. Alpine lake use and fish harvest have probably reached optimum levels in Idaho at the present time. The majority of the alpine lakes in Wyoming could support additional fisherman use. Warmwater fish populations can support additional pressure and should be able to support increased fishing demands for some years to come.

Augmentation of Supply

Wild salmonid stocks could not maintain fishing quality at the present level without supplementation with hatchery fish, particularly in reservoirs and accessible stream sections. Proposed reservoir developments and anticipated doubling of fishing pressure by the year 2000 will increase needs for more hatchery fish. A hatchery should be built and operated at Warm River Springs to supply cutthroat trout and other endangered species to required waters of national significance. This subregion contains the highest potential in Idaho for hatchery developments and expansion, particularly in the Snake River Valley in the general vicinity of Hagerman and Thousand Springs. Reconditioning of waters not presently suitable for hatchery development might provide new hatchery development potentials in the future.

Introduction of new fish species should be considered if ecologically sound.

Hunting

The important deer and elk winter ranges are mainly in the valleys and foothills between 4,500 and 7,000 feet elevation. Improved range management, including planting of browse, will be most effective if done in this elevational range. The Wyoming portion consists mainly of public lands administered by the National Park Service, U.S.D.A. Forest Service, and the Bureau of Land Management. The private lands in Wyoming occur mainly in the stream bottoms and associated slope areas which are considered critical winter range for elk, moose, deer, and mountain sheep. Any water development in these areas (below 7,000 feet elevation) will curtail the big game winter range which is already considered critical. Because of the critical elk winter range, Wyoming has an extensive

feeding program where approximately 7,500 elk are fed at eight different locations not including the National Elk Refuge. The stream and riverbank plant communities furnish forage and cover for moose, deer, and elk, which are free ranging. If these lands were taken for water impoundments or some other restrictive use they could not be replaced. The entire area including most privately-owned lands is being used by wildlife.

There are about 3,800 square miles of deer and elk winter range in the Idaho portion of Subregion 4. About 1,900 square miles of this is considered critical winter range, i.e., range which winters practically all of the local big game animals in winters which are more severe than the average winter. In many localities the critical winter range is the only winter range now available to big game. Reservation of big game winter range, and development of selected sites thereon, including sprinkler irrigation, offer the main potential for providing for the animals which will be displaced by water resource and other developments.

Future hunting of big game in this subregion will be largely dependent upon the retention of the remaining public land for wildlife habitat. The privately-owned land, although somewhat utilized by wildlife, is held in great demand and at such a high premium that it will someday be used for homesites and restricted recreation activities.

Future hunting of upland game will depend upon retaining and improving useful habitat on forest and rangelands, and planned management of habitat on agricultural lands and on lands interspersed with agricultural lands. Where water development makes it possible to cultivate areas which were previously native grassland or timber, the hunting of upland game will shift toward the species found on agricultural lands.

Fur animals can be maintained and perpetuated as a product associated with programs designed mainly for fish and various groups of wildlife. Imaginative water resource development can contribute importantly to fur animal habitat by maintaining protective cover along canals and streambanks.

Most waterfowl hunting in the future will be for mallards produced in Canada, and for Canada geese produced mainly in Idaho and Wyoming. Small sanctuaries and feeding areas, interspersed with hunting areas, will be needed to obtain better control of waterfowl movements and better distribution of the waterfowl harvest. An extensive pattern of waterfowl hunter distribution should be possible through leasing of lands or acquiring easements to provide hunting areas and access to existing huntable areas. Retention of suitable parcels of land in areas opened to agriculture by new

irrigation development will provide some waterfowl production habitat. Withdrawal of some 2,500 acres of omitted land along the lower reaches of Henrys Fork and South Fork Snake River for addition to the Camas National Wildlife Refuge would preserve a major component of the subregion's waterfowl production habitat.

Habitat improvement on State and Federal wildlife areas will have a major part in controlling waterfowl movements through providing additional waterfowl food and resting areas.

Habitat preservation and development should be emphasized in wetland areas threatened by drainage or other uses. This will involve purchase of key areas as opportunities and funds permit. Approximately 10,000 acres of land will be needed for wetland preservation and development in Idaho and 5,000 acres in Wyoming. Two areas with excellent potential for such development in Idaho include the Sterling wetlands in Sections 1, 12, and 13, T. 5 S., R. 31 E., and Sections 6, 7, and 18, T. 5 S., R. 32 E., and the Springfield wetlands located in T. 4 S., R. 32 E. Another area with excellent potential exists in northern Lincoln County, Wyoming.

It is possible that new wetlands may become available from new irrigation. Development plans should include the use of such wetlands for waterfowl management.

Some waterfowl production on private lands will result from irrigation in newly developed areas. Consideration for wetlands on private lands useful to waterfowl can be increased by devising financial assistance to land operators.

Waterfowl production on the public lands is safeguarded under present practices. Alteration of streamflows and surface water through logging and overgrazing is of consideration.

Lands managed primarily for game species will also benefit many species of nongame wildlife. Programs to benefit nongame wildlife should be emphasized and incorporated into municipal, suburban, and recreation area plans.

Nonhunting use of wildlife, particularly elk, moose, and other big game, reaches one of its highest known levels in this subregion. Continuing or increasing this level will be dependent upon retention of public lands for wildlife habitat. Local areas of special importance to the public for observing wildlife include Yellowstone National Park, Grand Teton National Park, the National Elk Refuge and several State-operated big game areas in Idaho and Wyoming.

Habitat Preservation

Present wildlife habitat must be retained and kept available to wildlife to meet future needs for hunting and nonhunting uses. This includes big game range, upland game habitat, protective cover along canals and streambanks useful to fur animals and other wildlife, waterfowl production habitat, and wetland habitat used by fur animals and other wildlife in addition to waterfowl. In some instances, land acquisition will be necessary, but agreements concerning use and maintenance of the habitat will suffice in many cases. Total land acquisition needs and costs are unknown, but the Idaho Fish and Game Department proposes acquisition of 26,000 acres of land by 1980, at an estimated capital cost of $3,300,000 and an annual operation and maintenance cost of $43,000. Purchase of 2,600 acres of land adjacent to Grays Lake National Wildlife Refuge should also be effected. The Wyoming Game and Fish Commission proposes acquisition of 7,000 acres of land under the Recreation and Public Purposes Act by 1980.

Zoning of flood plains should be accomplished between offset levees to provide wildlife habitat. Key big game and sage grouse ranges in the public domain or on State lands should be zoned for wildlife management.

Habitat Improvement

Needed habitat improvement can be accomplished by constructing fences, dikes, ditches, potholes, nesting structures, and watering devices, and by planting food and cover. Projected wildlife habitat improvement means by Federal and non-Federal agencies are shown in table 39. Location and development of a water source should be provided to supply 5,000 acre-feet of water to Grays Lake National Wildlife Refuge. Plans for non-Federal habitat improvement means are incomplete, and some tentative plans undoubtedly overlap some of the Federal plans. The extent of this overlap is not known. Measures in the table proposed by non-Federal agencies include those mentioned below.

Proposals for habitat improvement measures by 1980 in the subregion include construction of 40 miles of fence, 23 miles of dikes to form shallow impoundments, 15 miles of ditches and canals, 400 potholes, and 600 nesting structures. These improvements will entail an estimated capital cost of $668,000. Operation and maintenance will cost approximately $60,000 annually.

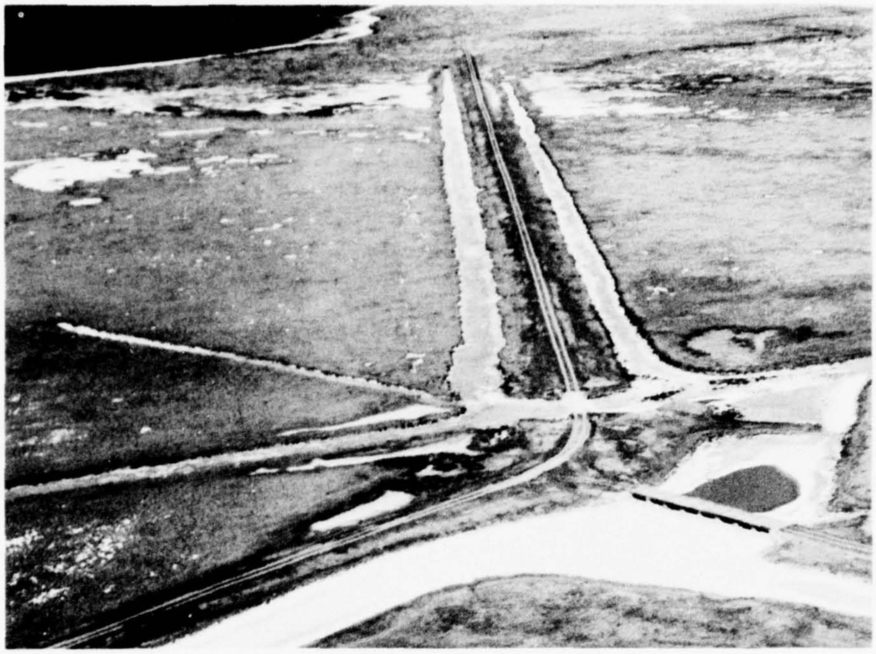
Plantings to provide food and cover are proposed by 1980 for 19,000 acres of land controlled by the Idaho Fish and Game Department at a capital cost estimated at $600,000 with annual operation and maintenance costs of $47,000.

Table 39 - *Wildlife Habitat Improvement Means, Subregion 4*

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Seeding and planting	acre	11,100	233.0	14,200	298.0	14,200	298.0
Forage release and prescribed burning	acre	18,150	101.0	22,750	128.0	28,750	149.0
Key area fencing	mile	30	43.0	40	57.0	30	43.0
Permanent openings	acre	430	24.0	550	31.0	540	30.0
Wildlife food crops	acre	21,750	489.4	32,485	730.9	41,410	931.7
Guzzlers	each	20	20.0	20	20.0	20	20.0
Shallow impoundments and marsh improvement	acre	2,680	143.4	2,280	134.5	3,030	163.7
Develop plantings	acre	120	1.0	150	1.0	150	1.0
Develop potholes	each	10	1.0	10	1.0	10	1.0
Develop nesting facilities	each	60	2.0	80	2.0	70	2.0
Develop water supply for refuge	acre-foot	5,000	89.0	--	--	--	--
Sub-totals			1,146.8		1,403.4		1.639.4
Planning							
Big game range analysis	acre	530,000	53.0	Not available		Not available	
Upland game habitat surveys	acre	4,800,000	240.0	Not available		Not available	
Habitat management plans	each	200	80.0	Not available		Not available	
Sub-total			373.0				
Total			1,519.8				

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Food and cover planting	acre	19,000	600	10,000	300	10,000	300
Development on 5% of new irrig. lands	acre	146,000	146	151,500	152	160,500	161
Fencing	mile	40	80	40	80	20	40
Watering devices	each	200	160	--	--	--	--
Dikes	mile	23	300	--	--	--	--
Ditches and canals	mile	15	105	--	--	--	--
Potholes	each	400	30	--	--	--	--
Nesting structures	each	600	153	--	--	--	--
Sub-totals			1,574		532		501
Planning							
Big game range analysis	acre	1,902 1/	190	Not available		Not available	
Upland game habitat surveys	acre	17,834 1/	1,783	Not available		Not available	
Sub-total			1,973				
Total			3,547				

1/ Thousand.



Dikes provide needed water areas for waterfowl. (Bureau of Sport Fisheries and Wildlife)

Various other measures should be provided to improve or develop habitat. Two thousand four hundred acre-feet of water should be obtained for the Market Lake State Wildlife Management Area. Financial assistance programs should be developed to encourage private landowners to preserve wetlands and uncultivated areas. Provision should be made for installation of 60 guzzlers and 200 water tanks with feeder lines and development of 200 springs and waterholes for upland game, big game, and domestic livestock. Management plans should be prepared for existing water developments where opportunity exists to benefit wildlife, especially the endangered and threatened species. Range productivity upgraded on State and private lands through improved livestock management could benefit wildlife materially. Improvement of big game winter range should eventually cover 40,000 acres, including 10,000 acres which should be irrigated if proven feasible. Protection of big game winter range and other key habitat areas will require the construction of 180 miles of fence. Drift fences should be provided as integral parts of effective passageways needed to permit big game migrations to cross freeways and reservoirs.

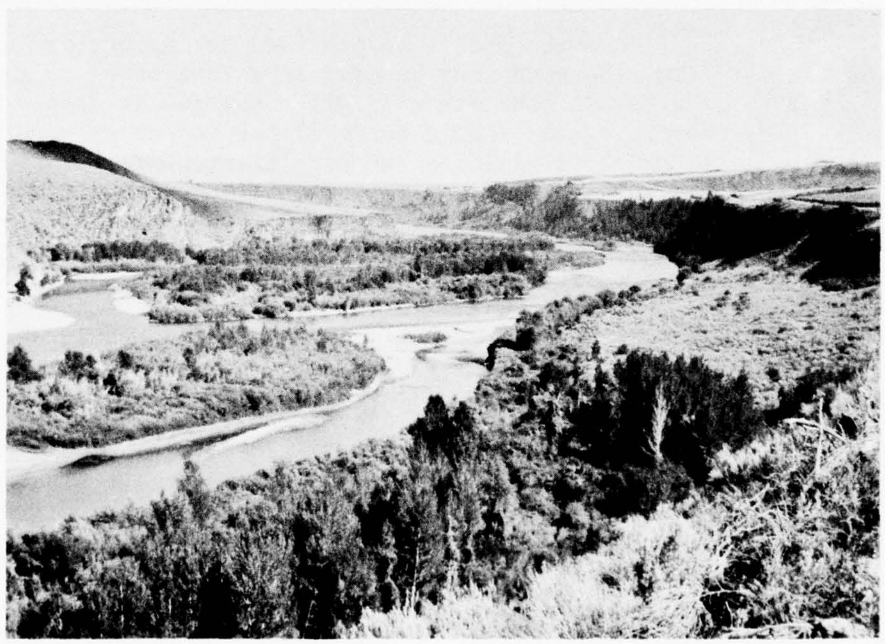
Some lands which may have agricultural potential also have great upland game bird potential which can be realized if land ownership patterns and land management plans are drawn up to supply

the habitat needs of upland game concurrent with the requirements of cultivated crops.

Upland game in newly developed agricultural areas can be a continuing crop if five percent of the land is held in public ownership specifically for upland game habitat for public use in hunting or other recreational activities. Providing for hunting and other recreational use of lands in agricultural areas at public expense has seldom been possible under the traditional system of private land ownership. However, there is now an opportunity to supply a public need by designing the pattern of land ownership and land use so that land for upland game habitat will be provided in much the same way that land has been made available for public roads in the past. During the era of development of newly watered lands this could be done simply by retaining portions of each area in public ownership when title on the remainder is passed to private ownership. It is in the public interest that lands be made available for wildlife use.

Greater Harvest

If present game ranges remain available, then mule deer can provide a major increase in big game hunting in the future. A moderate increase in elk hunting is anticipated, but other big



Critical big game winter range along South Fork Snake River within Lynn Crandall Project area is vital to maintain this valuable resource. (BSFW)

game species will support only minor increases in hunting. The additional hunting of deer and elk will be achieved largely through refined management which will permit a maximum annual harvest. The base for greatly expanded hunting of deer exists mainly in deer herds whose winter ranges are likely to be the first to be lost to water development as now commonly envisioned. For example, in Idaho about 20 percent of all deer harvested in this subregion come from herds which winter in the immediate vicinity of the proposed Lynn Crandall Dam and reservoir (see photo). No additional deer hunting can be expected in the future if major winter ranges are lost to other uses. Harvest above the present level will require that existing habitat be retained and that habitat improvement be accomplished.

Hunting access should be provided where needed.

Augmentation of Supply

Artificial production is not feasible in this subregion for providing supplies of big game for public hunting. Hence, it is not expected to become a significant part of the big game program.

Since upland game species are only lightly hunted, it is anticipated that present wild stocks and their descendants will meet the needs of the future without augmentation by artificial production. Proper management of existing habitat is expected to help waterfowl and fur animals to meet future needs.

LOCATICN MAP

SUBREGION 5

SUBREGION 5, CENTRAL SNAKE

GENERAL DESCRIPTION OF SUBREGION

Physically and biologically, the 36,825 square-mile Central Snake Subregion resembles its bordering subregion to the east. As in Subregion 4, elevational differences (1,600-10,000 feet) provide for a variety of climatic conditions which result in diverse flora and fauna. For example, the semidesert of the Snake River Plain supports extensive stands of sagebrush which gradually give way to the juniper-mahogany slopes of the Owyhee Mountains to the south, the forested Blue Mountains to the west, and to timbered extensions of the Rocky Mountains to the north and northeast.

The juniper-mahogany slopes of the Owyhee Mountains provide one of several habitat types. (Idaho Fish and Game Department)

HISTORY OF FISH AND WILDLIFE

The diversified and abundant biological resources played an important role in the history of this area. In early times, fish and wildlife provided food and fiber for the Indians, explorers,

trappers, immigrants, and pioneer settlers. Even today they furnish a significant side benefit of food to residents who pursue them primarily for sport. However, these latter-day resources, in many instances, are quite different from those of earlier times.

Historically, anadromous fish (salmon and steelhead trout) migrated upstream in Snake River into and beyond Subregion 5. All of the major tributaries--Weiser, Payette, Boise, Powder, Burnt, Malheur, Owyhee, and Bruneau Rivers--as well as most of the minor tributaries supported spawning runs by these species. In addition, waters teemed with resident game fish including cutthroat trout, rainbow trout, Dolly Varden, white sturgeon, and mountain whitefish. Nongame fish, particularly squawfish and sucker, were also present, but they apparently did not compete significantly with game fish populations.

Wildlife species also were plentiful. Big game consisted mostly of mule deer, elk, pronghorn antelope, and bighorn sheep, Bison also occurred here, but they probably disappeared shortly after the Indians became horsemen, shortly before white men arrived in the area. Wolf, grizzly bear, and mountain lion preyed on all big game species. Upland game, especially sage grouse and sharp-tailed grouse, inhabited the Snake River Plains. Waterfowl and fur animals abounded along the watercourses.

Although trappers and fur traders exploited the resources earlier, serious changes in fish and wildlife habitat began with the advent of mining in 1860. In addition, miners sometimes relied heavily upon fish and wildlife for food. As mining activity spread throughout the subregion, it was accompanied by the supporting activities of farming, ranching, and logging. Irrigation agriculture, power developments, and urbanization, followed by pollution and highway construction, all combined to decrease and otherwise change fish and wildlife habitat.

Fish were most significantly affected by dredge mining, irrigation diversions, dams, and reservoirs. In 1901, a power dam constructed at Swan Falls blocked anadromous fish migrations to upper Snake River and its tributaries. Subsequently, other dams constructed on downstream tributaries in Subregion 5 further restricted spawning areas and finally, construction of Oxbow and Brownlee Dams in the late 1950's blocked anadromous fish runs altogether. In addition, resident fish were adversely affected. Dredging destroyed much habitat, and the reservoirs slowed the waterflow causing increased water temperatures and decreased streamflows. Conditions thus created were less suitable for trout and other gamefish species. In contrast, rough fish populations found these conditions more favorable and increased to compete successfully with game fish, replacing them in many areas.

Wildlife populations were also affected. In addition to wildlife losses from excessive trapping and hunting, extensive farming, competition from livestock, and inundation by reservoirs combined to destroy and change wildlife habitat. Mule deer, elk, and pronghorn antelope ranges were restricted. Of the large predators, only the mountain lion survived. Sage grouse and sharp-tailed grouse were greatly depleted. However, waterfowl and fur animals benefited in some instances from irrigation developments.

The first attempts to stem the tide of destructive influences occurred in the late 1800's and early 1900's. Bag limits were imposed and seasons defined. Later, habitat development projects were undertaken for both fish and wildlife, and new species were introduced to subregion lands and waters. Fish introduced included brown, brook, and lake trouts; smallmouth and largemouth basses; bluegill; black crappie; yellow perch; channel catfish; brown and black bullheads; and European carp. Ring-necked pheasant, chukar, Hungarian partridge, valley quail, bobwhite, and Merriam's turkey were successfully introduced. Other actions taken involved attempts to pass anadromous fish over the dams, hatchery construction for anadromous and resident fish, and chemical control of undesirable fish.

Although many of these measures succeeded in slowing the downward trend, many native fish and wildlife populations remain below former numbers.

PRESENT STATUS

The groups of fish and wildlife comprise resident fish, big game, upland game, fur animals, waterfowl, and other wildlife. All of these resources are of recreational and commercial significance. Capacity for increased use exists mainly in deer hunting, upland game hunting, and fishing for resident fish. Because of the varied topography and land use there is great variety in habitat and in the species of fish and wildlife found here. Some species living here occur only in limited numbers elsewhere. The combination of diverse habitats which range from the high mountains to the sagebrush plains and the upper part of the deep gorge of the Snake River is a nationally significant attribute of the Central Snake Subregion.

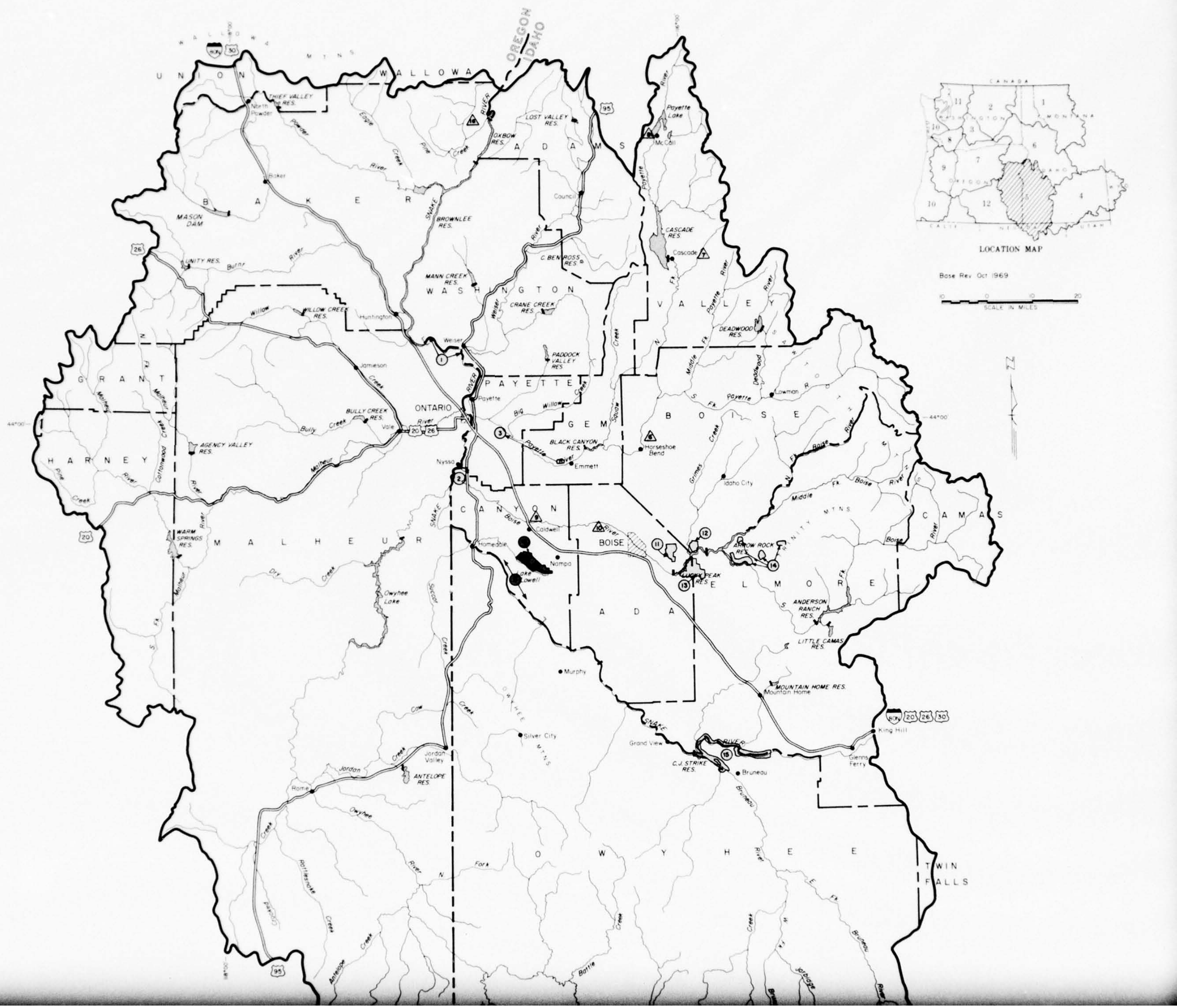
Figure 18 locates and identifies State fish hatcheries and public fishing areas, State wildlife management areas or big game ranges, and national wildlife refuges. All of these facilities and lands are of special value to one or more kinds of fish and wildlife.

Resident Fish

Rainbow trout are the principal resident salmonid fish, but brook trout and cutthroat trout are also important here. Lahontan

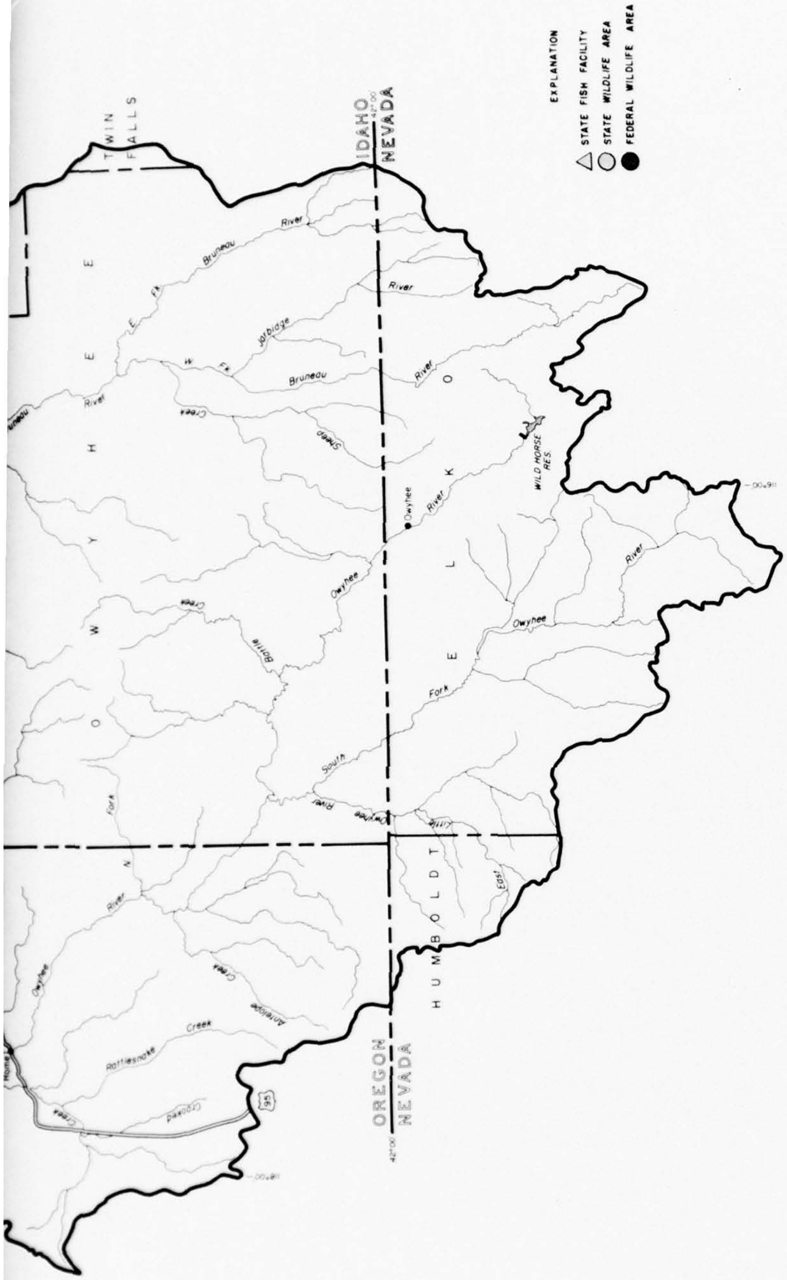
FIGURE 18. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	Snake River Islands Wildlife Mgt. Area	218	
	Fort Boise Wildlife Mgt. Area		
2	Ft. Boise Segment	1,460	
3	Payette River Segment	300	
	Deer Flat National Wildlife Refuge		
4	Lake Lowell Sector	11,424	
5	Snake River Islands Sector	909	
6	Horseshoe Bend Millpond Public Fishing Area	35	
7	Horsethief Reservoir Public Fishing Area	453	
8	McCall Fish Hatchery	15	303
9	Caldwell Ponds Public Fishing Area	40	
10	Eagle Fish Hatchery	32	40,381
	Boise River Elk and Deer Winter Range		
11	Boise Front Segment	4,428	
12	Mores Creek Segment	3,543	
13	Charcoal Segment	4,589	
14	South Fork Segment	2,084	
15	C. J. Strike Wildlife Mgt. Area	5,299	
16	Oxbow Hatchery		3,000



LOCATION MAP
Base Rev Oct 1969
SCALE IN MILES
OREGON
IDAHO
ONTARIO
BOISE
UNION
WALLOWA
BAKER
ADAMS
WASHINGTON
PAYETTE
GEM
VALLEY
BOISE
CAMAS
ELMORE
ADA
CANYON
MALHEUR
GRANT
HARNEY
OWYHEE
TWIN FALLS
THIEF VALLEY RES.
MASON DAM
UNITY RES.
OXBOW RES.
BROWNLEE RES.
LOST VALLEY RES.
C. BEN ROSS RES.
MANN CREEK RES.
CRANE CREEK RES.
PADDOCK VALLEY RES.
CASCADE RES.
DEADWOOD RES.
BLACK CANYON RES.
WILLOW CREEK RES.
BULLY CREEK RES.
AGENCY VALLEY RES.
WARM SPRINGS RES.
ARROW ROCK RES.
LUCKY PEAK RES.
ANDERSON RANCH RES.
LITTLE CAMAS RES.
MOUNTAIN HOME RES.
C.J. STRIKE RES.
ANTELOPE RES.
Owyhee Lake
Payette Lake
Lake Lowell
North Powder
Baker
Huntington
Weiser
Council
McCall
Cascade
Payette
Emmett
Horseshoe Bend
Lowman
Idaho City
Vale
Jamieson
Nyssa
Caldwell
Nampa
Homedale
Murphy
Silver City
Jordan Valley
Rome
Grand View
Bruneau
Mountain Home
Glenns Ferry
King Hill

2



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

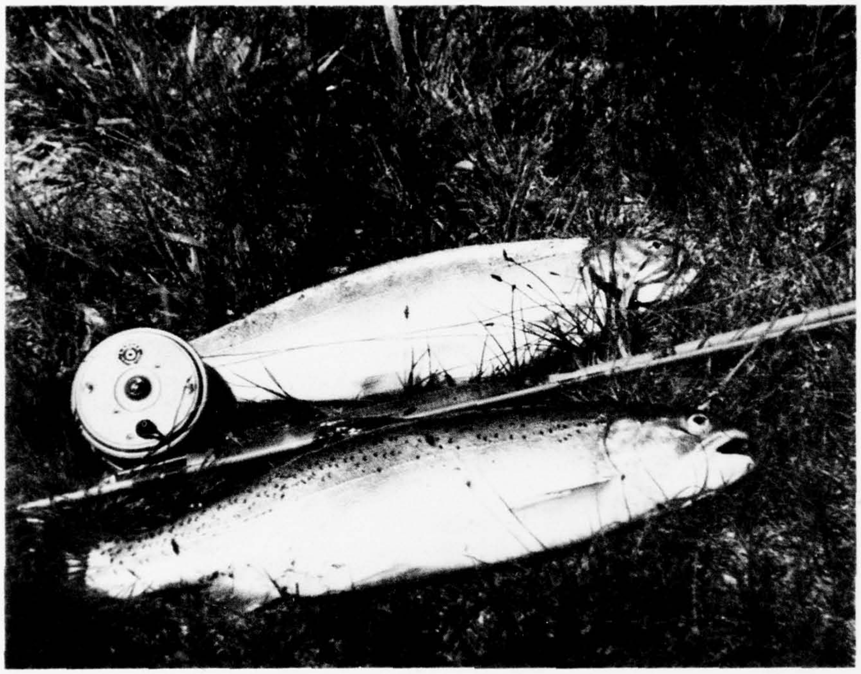
LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

CENTRAL SNAKE SUBREGION 5

1970

FIGURE 18

cutthroat are found only in Nevada mountain streams. Dolly Varden and brown trout occur in some streams. The introduced kokanee, coho, lake trout, and golden trout occur locally, the latter in select high mountain lakes. Mountain whitefish are found in many of the larger streams. Other fish which provide sport fishing include perch, bluegill, largemouth bass, smallmouth bass, crappie, sturgeon, channel catfish, and bullhead. Other fish which occur here include sucker, carp, chiselmouth, chub, shiner, dace, sculpin, madtom, and squawfish.



Rainbow trout are the principal resident salmonid fish. (Oregon State Game Commission)

Habitat

Total water area in the subregion is about 170,400 surface acres. Habitat for resident fish includes approximately 3,300 miles of streams, over 180 alpine lakes, and about 30 reservoirs of various sizes. About half of the tributary streams are less than 10 miles in length and nearly all of them are less than 30 miles in length. Four of the reservoirs each contain more than 10,000 surface acres when full. In addition, waters on private lands include a minimum of 2,284 farm ponds, 58 stocked fish ponds, 5 managed fish ponds, and 182 irrigation storage reservoirs.

Stream classifications are available for 1,968 miles of Idaho streams (figure 19). Streams have not been classified in the Oregon part of the subregion. Idaho stream classification is based upon esthetics, use, productivity, and size. Special consideration was given to unique or endangered species, anadromous fish, vital spawning areas, stream potentials, and enhancement possibilities. Class 1 streams are those having multistate value. They include any stream or portion containing or having seasonable potential for anadromous fish, endangered species, unique populations of wild fish, or containing spawning area vital to perpetuation of lake or reservoir populations. Class 2 includes streams of value to large districts of the State. Class 3 streams are those of value to small districts, such as counties. Class 4 streams are those of restricted local value. Classifications for 1,968 miles of Idaho streams in the subregion include 195 miles of Class 1 streams, 273 miles of Class 2 streams, 1,080 miles of Class 3 streams, and 420 miles of Class 4 streams.

Use

Annual sport fishing use for 1966 is estimated at 610,000 angler-days. Trout fishing provides about 90 percent of the total fishing activity. Fishing for warmwater species predominates in the Snake River reservoirs and in some other reservoirs including Lake Lowell, Paddock Valley Reservoir, and Owyhee Lake. Sport fisherman use for the three kinds of waters is shown in table 40.

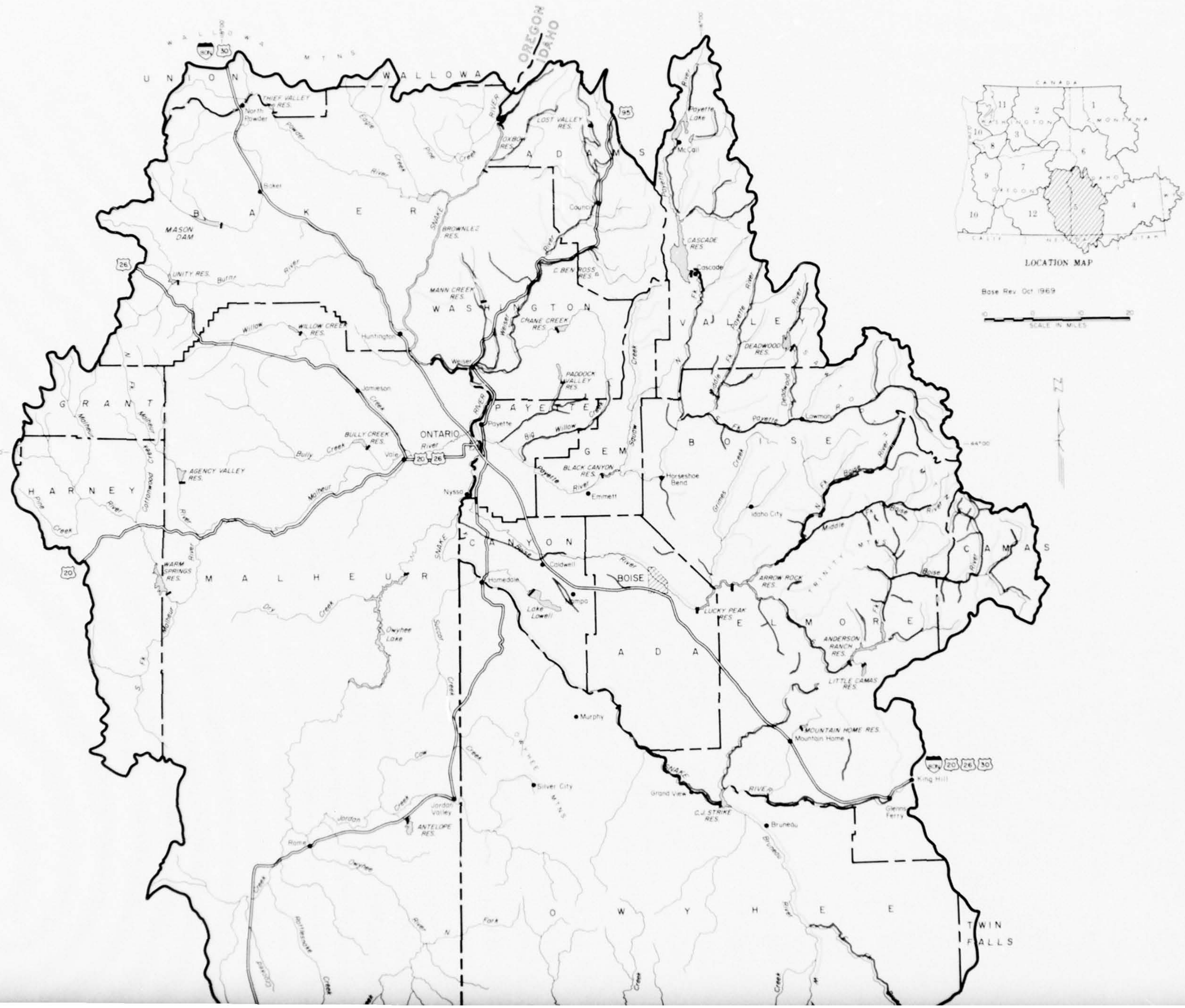
Table 40 - Estimated Annual Sport Fishing Use of Resident Fish, Subregion 5 1/

	Angler-Days			
Waters	Idaho	Nevada	Oregon	Totals
Streams	245,653	3,500	61,292	310,445
Lakes and Ponds	55,220	--	--	55,220
Reservoirs	157,730	25,000	61,700	244,430
Totals	458,603	28,500	122,992	610,095

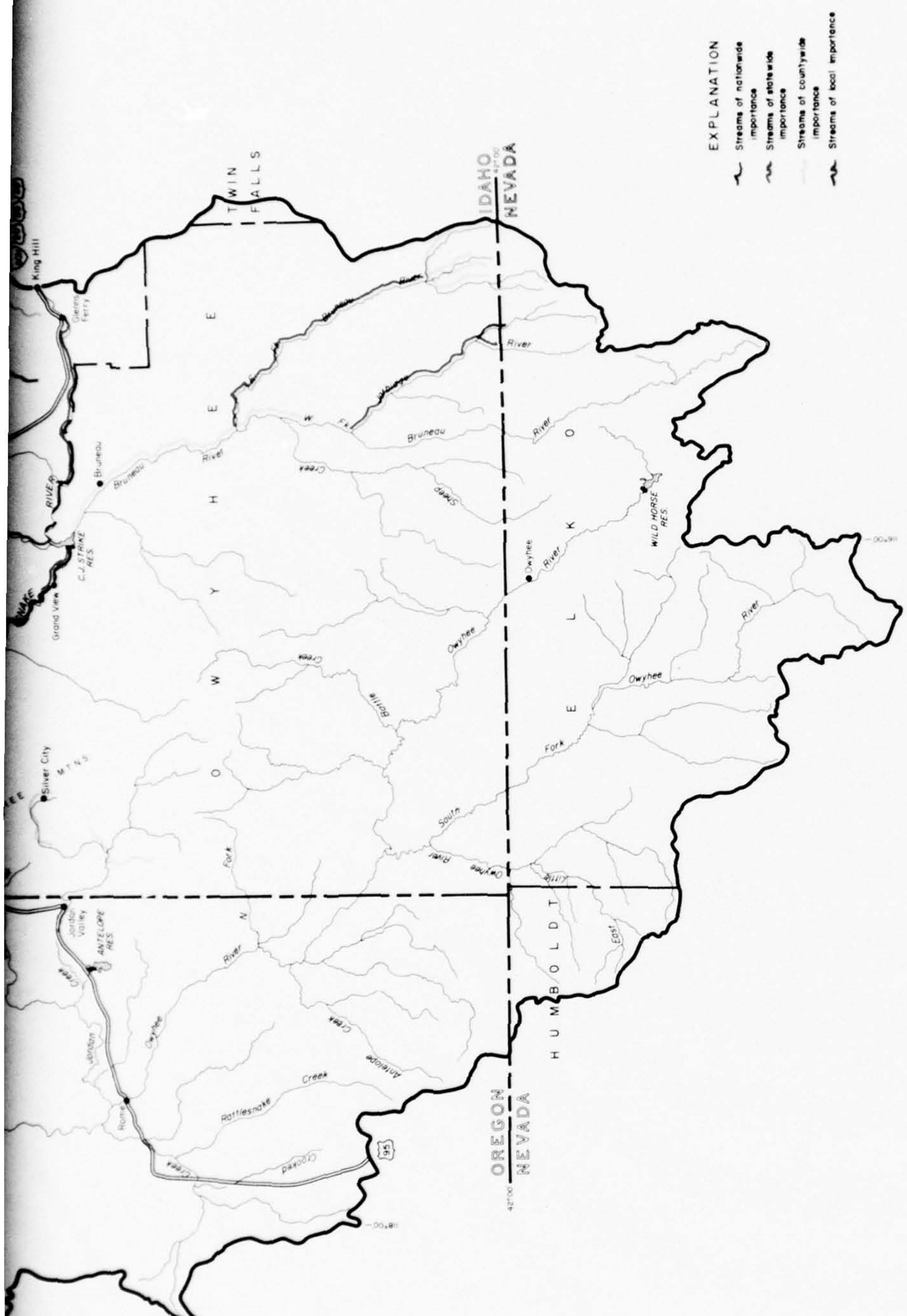
1/ Based upon information supplied by the Idaho Fish and Game Department, the Nevada Fish and Game Department, and the Oregon State Game Commission.

Commercial fishermen took 17,605 pounds of rough fish from C. J. Strike Reservoir in 1965.

Angling for resident fish is a major recreation outlet. The fishing is of national significance, combining quality with great


LOCATION MAP
Base Rev. Oct 1969
SCALE IN MILES
OREGON
IDAHO
ONTARIO
BOISE
UNION
WALLOWA
BAKER
ADAMS
WASHINGTON
VALLEY
PAYETTE
GEM
BOISE
CAMAS
ELMORE
ADA
CANYON
MALHEUR
GRANT
HARNEY
OWYHEE
TWIN FALLS
THIEF VALLEY RES.
LOST VALLEY RES.
OXBOW RES.
BROWNLEE RES.
MANN CREEK RES.
CRANE CREEK RES.
C. BEN ROSS RES.
CASCADE RES.
DEADWOOD RES.
PADDOCK VALLEY RES.
BLACK CANYON RES.
MASON DAM
UNITY RES.
WILLOW CREEK RES.
BULLY CREEK RES.
AGENCY VALLEY RES.
WARM SPRINGS RES.
ARROW ROCK RES.
LUCKY PEAK RES.
ANDERSON RANCH RES.
LITTLE CAMAS RES.
MOUNTAIN HOME RES.
C.J. STRIKE RES.
ANTELOPE RES.
Owyhee Lake
Lake Lowell
Payette Lake
North Powder
Baker
Huntington
Weiser
Council
McCall
Cascade
Payette
Vale
Nyssa
Jamieson
Emmett
Horseshoe Bend
Idaho City
Caldwell
Homedale
Nampa
Murphy
Silver City
Jordan Valley
Rome
Grand View
Bruneau
Mountain Home
Glenns Ferry
King Hill

2



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

CLASSIFIED FISHING STREAMS

CENTRAL SNAKE SUBREGION 5

1970

FIGURE 19

variety. It ranges from trout fishing in high mountain lakes to fishing for channel catfish in the mainstem and impoundments of the Snake River. In addition, the area maintains a sturgeon fishery which is nationally famous. Expenditures for fishing in 1965 were about $3,038,000.

Capacity in terms of fishing use which the resource could sustain at the present rate of fisherman success is unknown, but it would probably be considerably above the current use. Difficult or limited access limits present fishing use of many waters.

Factors Affecting Resource

A most serious detrimental factor in this area is erosion on range and agricultural land which causes siltation and turbidity of waters. In addition, the amount, stability, and temperature of streamflows are all affected by irrigation. Water fluctuations, rapid drawdowns, and irrigation diversions create fishery problems. Irrigation return flows sometimes cause siltation, and return flows or drains which contain pesticides are of particular concern. Road construction, stream channeling, logging, grazing, and mining contribute to siltation and destruction of fish habitat. Industrial pollution, mainly from food processing plants, is serious in some localities. Lack of spawning habitat limits productivity of some waters.

Road construction and stream channeling like this destroy fish habitat. (Idaho Fish and Game Department)

Beneficial developments and programs include rough fish control followed by stocking of suitable species, creating small impoundments specifically to provide local fisheries, restoring stream channels damaged by mining and logging, providing public access to fishing, and introduction of desirable species of fish. New species introduced recently include kokanee and coho. Industrial and municipal pollution abatement is progressing in various areas.

In the year ending September 30, 1965, over 254,500 pounds of fish were stocked in Idaho and at least 10,000 pounds in Oregon. About 95 percent of the total poundage consisted of rainbow trout, but several other salmonid species and some warmwater species were stocked in smaller amounts.

Some of the farm ponds, fish ponds, and reservoirs enumerated earlier under "Habitat" have been developed so that they contribute to the fish resource.

Big Game

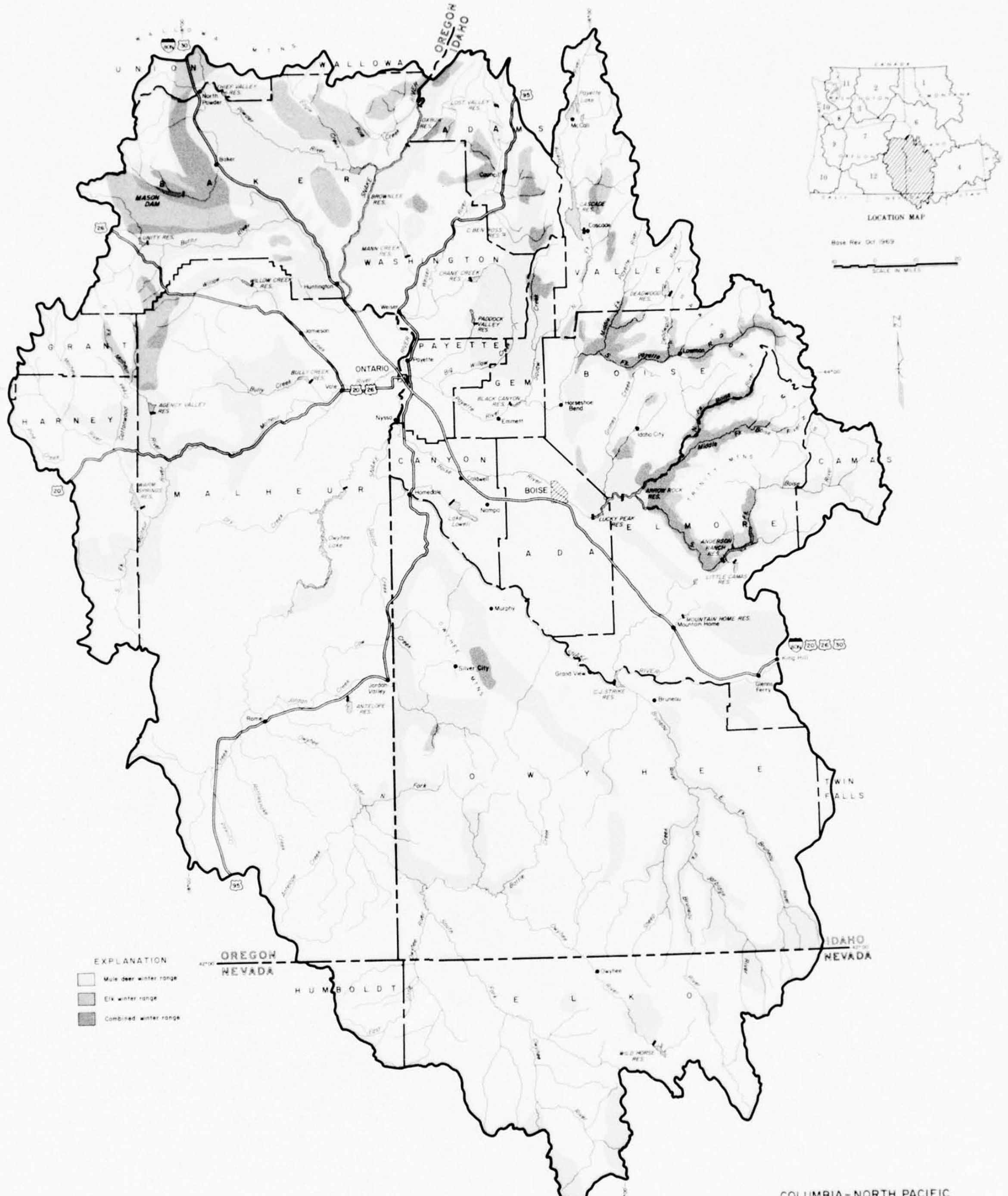
Big game species found here are elk, mule deer, white-tailed deer, moose, pronghorn antelope, bighorn sheep, mountain goat, mountain lion, and black bear. Figure 20 shows elk and mule deer winter ranges. Pronghorn antelope range is shown on figure 21. Maps are not shown for the other big game species since their distribution is rather limited and detailed information on their seasonal distribution is not available.

Habitat

Big game habitat includes some high, rough country, extensive coniferous forests largely above 4,000 feet in elevation, and great expanses of sagebrush-grassland foothills which surround the irrigated valleys and the isolated mountain ranges in the southwestern part of the subregion.

Elk Elk are widely distributed throughout the areas of coniferous timber which occurs mainly in the mountains of the northwestern and northern parts of the area. Limited numbers of elk also occur in the Owyhee Mountains.

Mule Deer Mule deer are numerous and widely distributed wherever suitable habitat exists. Relatively few deer occur on the arid Snake River plain or in the lower Boise and Payette River valleys which are used mainly as irrigated croplands. Mule deer winter areas consist mainly of sagebrush-grassland range and bitterbrush-sage-mountain mahogany ranges in the southwest part of the subregion. Deer are limited by the extent of winter forage



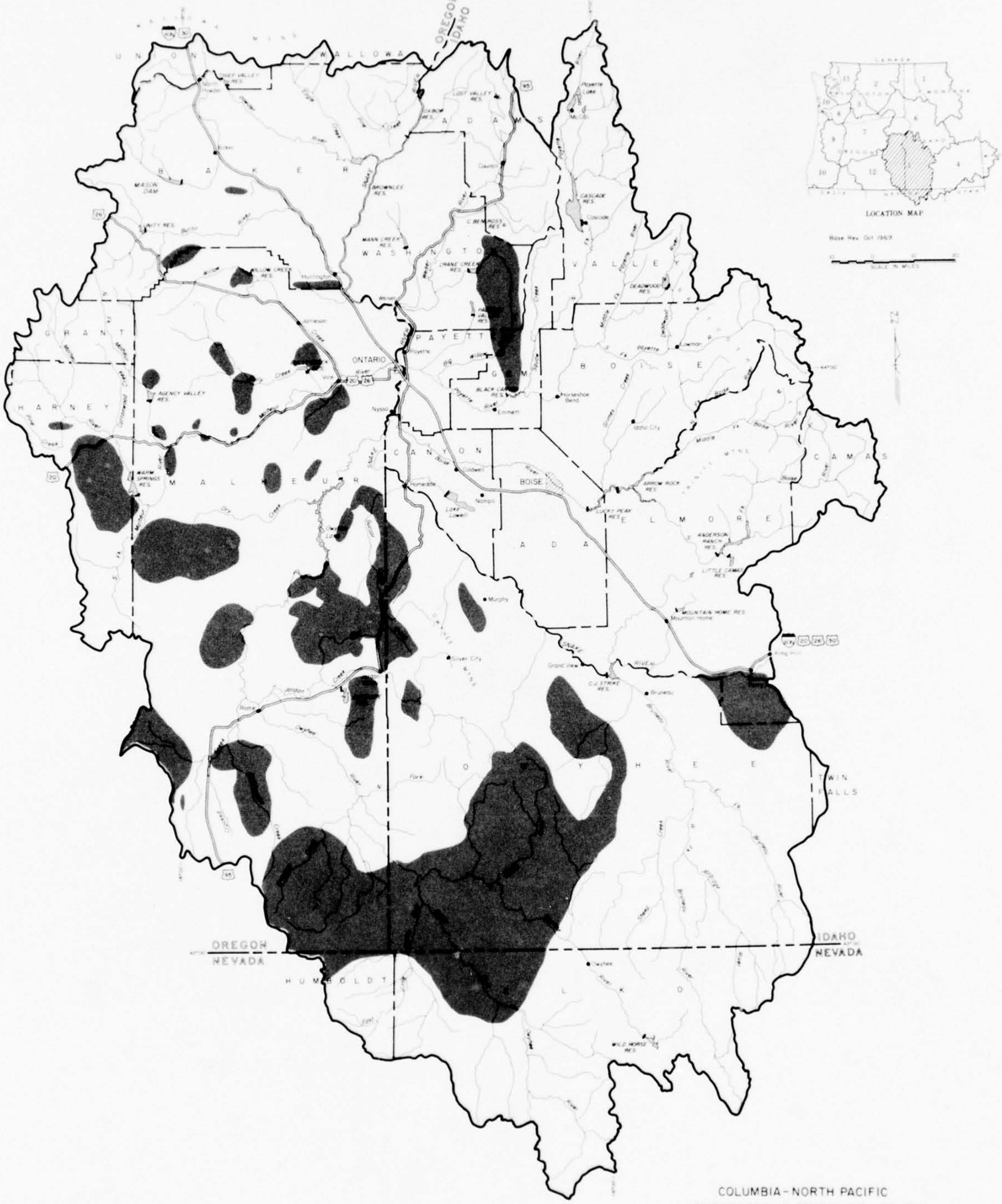
COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

MULE DEER AND ELK WINTER RANGES

CENTRAL SNAKE SUBREGION 5

1970

FIGURE 20



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

VITAL PRONGHORN ANTELOPE RANGE

CENTRAL SNAKE SUBREGION 5

1970

FIGURE 21

and by other uses of land on some ranges adjacent to extensive summer range. Browse is very scarce in upper Hells Canyon and it is heavily utilized by large numbers of mule deer which winter here.

White-tailed Deer White-tailed deer occur in small numbers in the North Fork of the Payette River drainage, but there are few or none further west or southwest.

Moose Moose are found in limited numbers in the coniferous forest area of the mountains west of Cascade Reservoir. Scattered observations of moose in the timbered country somewhat further south have been made occasionally, but only the Cascade area is considered significant as moose range.

Pronghorn Antelope Pronghorn antelope are found mainly in the drainages of the Owyhee River in Idaho, Nevada, and Oregon. Antelope range in this tri-state area is mainly in sagebrush-grassland and semi-desert brushland.

Bighorn Sheep From 1963 through 1967 a total of 50 bighorn sheep, trapped in British Columbia, were released in Owyhee County in southwest Idaho. In 1965 a group of 17 bighorn sheep from Hart Mountain was released in Oregon, near Owyhee Reservoir. These sheep and their progeny are the only bighorn sheep known to occur in this subregion. Remote areas, more or less protected by rough canyon walls, provide bunchgrass and other forage which support these animals.

Mountain Goat The rugged Sawtooth Mountains in the upper South Fork of the Payette and Boise River watersheds provide the main mountain goat habitat in the Central Snake Subregion.

Mountain Lion The rough mountainous areas, especially in the northeast where human access is difficult, provide most of the mountain lion habitat. However, some mountain lion are taken occasionally from other areas.

Black Bear Black bear are common in the timbered mountainous range in the northeastern and northern parts of the subregion.

Use

Estimated hunting use of big game in 1965 totaled 335,000 man-days. The distribution of this use by species and States is shown in table 41. Hunting of moose and bighorn sheep was not permitted in 1965. The mountain lion is now classified as a game animal in Nevada and Oregon. There was no closed season on the species in Nevada in 1965 and no open season in Oregon in 1965. In Idaho the mountain lion is classified as a predatory animal. An unknown amount of mountain lion hunting occurs.

Table 41 - Estimated Hunting Use of Big Game, Subregion 5, 1965 1/

Species	Hunter-Days Idaho	Nevada	Oregon	Totals
Mule Deer	153,200	19,610	84,272	257,082
White-tailed Deer	-- 2/	--	--	-- 2/
Elk	38,359	--	34,213	72,572
Pronghorn Antelope	243	--	315	558
Mountain Goat	150	--	--	150
Black Bear	2,000	--	2,500	4,500
Totals	193,952	19,610	121,300	334,862

1/ Based upon information supplied by Idaho Fish and Game Department, Nevada Fish and Game Department, and Oregon Game Commission.

2/ A few white-tailed deer are taken annually, but are included with mule deer in this table.

Estimated annual expenditures amount to about $3,198,000 for big game hunting. Informed judgment values in addition to those shown by expenditures would place the resource value considerably higher. Winter "deer watching," to single out one instance of non-consumptive use, is a popular activity in many parts of the Central Snake drainage.

The capacity for increased use of big game lies mainly in mule deer hunting. Deer in parts of the Central Snake Subregion receive relatively light hunting pressure because of their remote locations at long distances from the centers of human population.

Factors Affecting Resource

Joint use of range by big game and domestic animals has been detrimental to big game, particularly deer, in many areas. While this was formerly considered primarily a winter problem it has more recently been recognized that adjustments in spring, summer, and fall use by livestock must be made if ranges are to provide sufficient forage for desired populations of deer. Deteriorated winter deer ranges in the Boise and South Fork Payette River drainages have long been a problem, especially on the steep slopes where granitic soils and high summer temperatures are not favorable to browse rehabilitation.

Summer deer range has deteriorated in many areas which have received subnormal precipitation in recent years. Improvement of ranges, involving fencing, planting of browse plants and control of

livestock grazing, has benefited certain areas but the local nature of such improvement has not kept pace with the overall problem. Regulated livestock use of timbered areas has generally been beneficial to big game in recent years. However, deer harvests have usually been less than the annual herd increase, especially in areas lacking roads or other means of access for hunters. This has resulted in buildup of deer herds and excessive use on some winter ranges. Poorly justified predator control has often contributed to winter deer herd and range problems, but factually based game management programs are rapidly correcting this situation.

Proposed water developments, including the Garden Valley and Twin Springs projects, threaten blockage of deer migration routes and drastic reduction of important winter deer range through inundation. Deer losses from drowning or accidents on migration routes have been common in the Boise River drainage since the initial filling of Lucky Peak Reservoir.

Lucky Peak Reservoir destroyed key winter range and flooded an important deer migration route. (Idaho Fish and Game Department)

Some pronghorn antelope ranges have been lost to cultivation, while others have been altered by sagebrush removal programs. Drouth and overgrazing have also had detrimental effects on antelope range by reducing succulent forage on natural meadowlands.

Cooperative range research and game range development programs involving State and Federal agencies have been helpful in establishing a basis for future big game management. These include the joint

inspection of areas and planning of programs which will protect and improve the production of range forage while retaining wildlife habitat. Hunting seasons based on facts, together with improved access for hunters, have increased the public hunting opportunity. Acquainting the public with the need for range protection and development and related programs has furthered the progress of such work.

Upland Game

Upland game species in Subregion 5 are ring-necked pheasant, chukar, Hungarian partridge, valley quail, mountain quail, bobwhite, blue grouse, ruffed grouse, spruce grouse, sage grouse, sharp-tailed grouse, wild turkey, mourning dove, cottontail, and pigmy rabbit.

Figure 22 shows the general ranges of the ring-necked pheasant and the chukar. Other upland game species are not shown since detailed information is lacking.

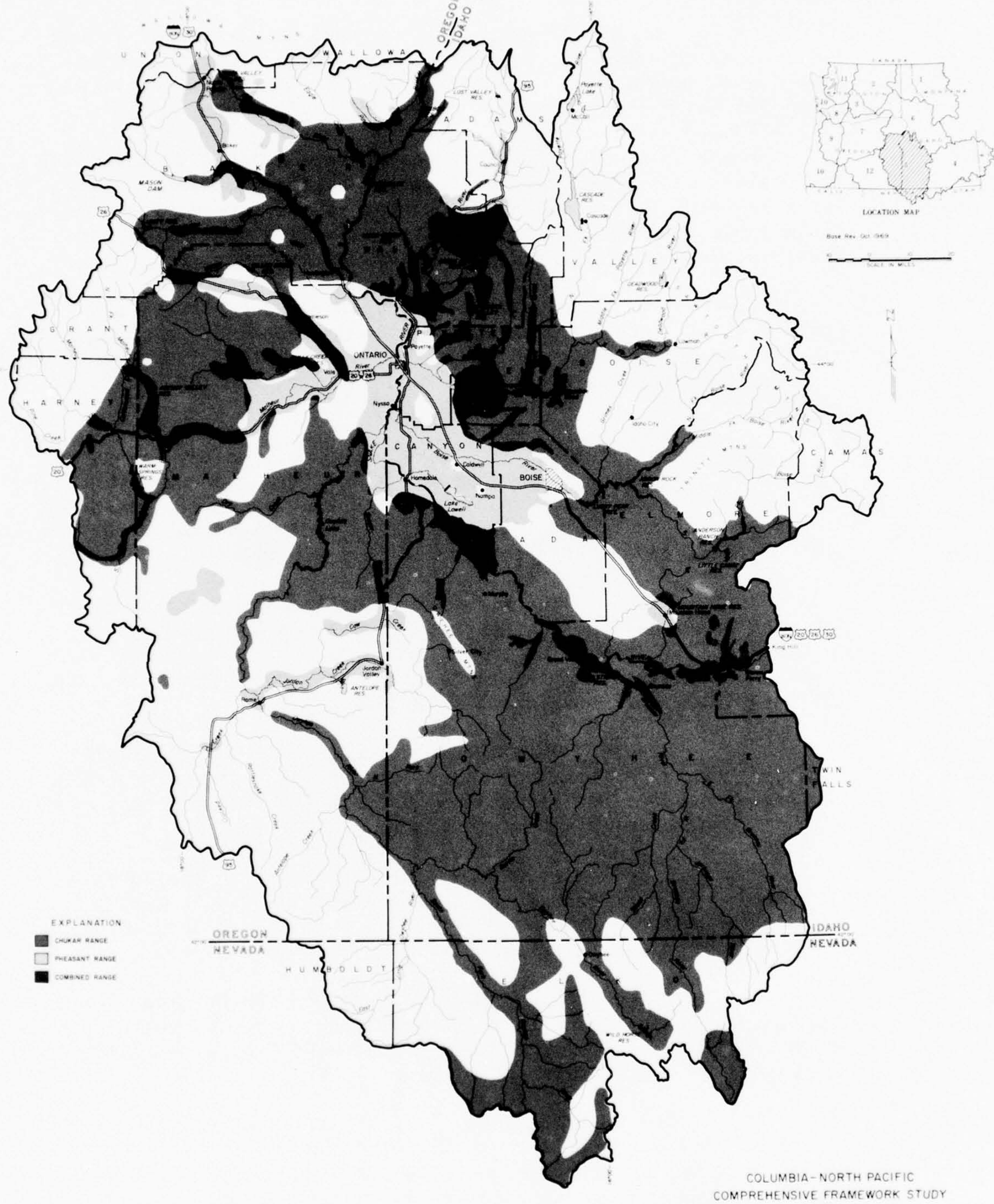
Habitat

Upland game habitat is varied, from the alpine mountainous areas and coniferous forests to the irrigated farmlands and the semi-arid sagebrush plains. The varied habitat is reflected in the great variety of upland species which occur here. Habitat for each species is described separately.

Ring-necked Pheasant The irrigated lands make this one of the most important pheasant areas in the West. The excellent food supply and the mild winters in the major irrigated areas offset a general lack of winter cover on the irrigated croplands. In areas where considerable dry farmed lands and pasture lands occur, pheasant are moderately abundant in good water years. The sprinkler-irrigated lands offer little for these birds since clean one-crop farming provides very little cover and no year-round water.

Chukar Excellent chukar habitat is found along the Snake River in the northern part of the subregion. The sagebrush foothills adjoining the river and its major tributaries are also good producers wherever suitable habitat occurs.

Hungarian Partridge The grassy foothills provide excellent habitat for this species, especially north and northeast of the Snake River. In many local areas, chukar habitat overlaps that of Hungarian partridge and mixed bags are common in the hunting season. Hungarian partridge are also found in low numbers throughout the irrigated bottomlands, but this is not optimum habitat for the species.



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

CHUKAR AND PHEASANT GENERAL RANGES

CENTRAL SNAKE SUBREGION 5

1970

FIGURE 22

Valley Quail This species is found mainly in the bottomlands along the Snake River, but it also ranges into the foothills along creek tributaries. Scattered coveys also occur on irrigated croplands which are not prime habitat for valley quail.

Mountain Quail This species prefers habitat in the small tributary creeks which descend from the higher timbered country, but some occur in bottomlands along the larger watercourses where their range overlaps the distribution of valley quail somewhat. They are closely associated with water and brushy cover.

Bobwhite The bottomlands along the Snake, Boise, and Payette Rivers provide an interspersion of cropland, pasture, and brush cover which makes excellent bobwhite habitat. Bobwhite densities in this area are excellent by comparison with the standards of Missouri and other major bobwhite States.

Blue Grouse Blue grouse are abundant in a few areas, but scattered populations occur throughout the forested country. They thrive best in mountainous habitat where the lower well-grassed slopes provide nesting and brood-rearing cover, and the upper slopes provide coniferous cover used in the fall and winter.

Ruffed Grouse The timbered areas and the lower shrub-bordered drainages provide habitat in which ruffed grouse are sparsely distributed. The forest type available here generally lacks the well-watered mixture of deciduous trees, conifers, and berry-yielding shrubs which this species prefers.

Spruce Grouse This species occurs mainly in the higher timbered country. Its range sometimes overlaps with blue grouse but lacks the distinct elevational differences from spring to fall which is characteristic of blue grouse.

Sage Grouse Most of the sagebrush range in the subregion is occupied by sage grouse in varying numbers. Meadow and seep areas in which forbs and other green vegetation are abundant are used by sage grouse, particularly in summer and early fall.

Sharp-tailed Grouse The sharp-tailed grouse is a relict species here, hanging on in scattered flocks. The foothills slopes in the northern part of the subregion provide habitat on the better grasslands with scattered shrub cover.

Wild Turkey Wild turkey habitat is rather limited, including mainly the edges of the coniferous timber belt where suitable roost trees and a variety of natural foods occur. Present populations of turkey are found only in or adjacent to areas where recent introductions have been made.

Mourning Dove The fruit orchards, farm trees, and sagebrush flats supply excellent nesting habitat for mourning dove. Food is abundant in the irrigated croplands. Foothills are used as staging areas for doves just prior to migration in late summer and early fall.

Cottontail and Pigmy Rabbit The river bottoms of the main stream drainages provide optimum habitat for the cottontail which occurs in reasonably good numbers throughout the irrigated lands. The pigmy rabbit prefers the sagebrush flats and foothills.

Use

The estimated use of upland game by hunters in 1965 was 498,000 man-days. Table 42 shows use for the species which could be hunted legally. No turkey hunting was permitted in either 1965 or 1966.

Table 42 - Estimated Hunting Use of Upland Game, Subregion 5, 1965 1/

	Hunter-days			
Species	Idaho	Nevada	Oregon	Totals
Ring-necked Pheasant	198,300	--	58,611	256,911
Chukar	40,900	2,192	29,713	72,805
Hungarian partridge	38,700	244	10,039	48,983
Valley Quail	26,400	-- 3/	21,102	47,502
Mountain Quail	2,500	--	--	2,500
Bobwhite	2,500	--	--	2,500
Ruffed Grouse	4,800	--	--	4,800
Blue Grouse	8,500	-- 3/	1,000	9,500
Spruce Grouse	900	--	--	900
Sage Grouse	4,600	1,350	662	6,612
Mourning Dove	26,900	--	2,296	29,196
Cottontail and Pigmy Rabbit	10,100	--	6,000	16,100
Totals	365,100	3,786	129,423	498,309

1/ Based on information supplied by Idaho Fish and Game Department, Nevada Fish and Game Department, and Oregon State Game Commission.
2/ Oregon data, 1966.
3/ Valley quail and blue grouse hunting totaled less than 100 hunter-days.

There is considerable capacity for increase of all upland game except mountain quail, ruffed grouse, spruce grouse, and sharp-tailed grouse. These species are rather limited in distribution.

The capacity for increased use of other upland game, except for pheasant, indicates a potential of more than double the current use. Most farmlands are open for pheasant hunting, but public access is restricted in some areas.

Pheasant hunting makes up slightly over half the current hunter use of upland game and it will continue to be important in the future. However, the largest part of the capacity for increased use rests in other species which, in combination, could equal or exceed pheasant hunting in recreation potential. Remoteness and difficult access will doubtless keep use of some segments of this potential at a low level.

The great variety of upland game makes this area very attractive to those interested in these species. Few areas offer more variety, and the relatively low hunting pressure on most species results in high quality recreation. Estimated hunter expenditures amounted to about $2,385,000 for upland game hunting in 1965, but this is not indicative of the total resource value.

Factors Affecting Resource

Many of the detrimental factors, as well as the beneficial developments, affecting upland game are directly related to land use. The extent to which land managers give positive consideration to upland game requirements when land use plans are made will largely determine the future status of upland game.

Detrimental Factors As use of irrigated croplands increases the subregion will suffer continual loss of pheasant habitat because of intensive farming methods. In the immediate future, this loss may be partly compensated for by creation of pheasant habitat through agricultural use of some lands which are now semi-arid and uncultivated. Newly farmed and irrigated tracts usually provide good pheasant habitat, but habitat is reduced as the tracts mature, waste areas disappear, fields are farmed to the fences, and ditches are cleared of weeds.

Ruffed grouse are limited by the distribution of their preferred habitat and by locally heavy grazing of mixed conifer-hardwood types. Blue grouse have been adversely affected by long-term drought and heavy grazing which severely reduced cover quantity and quality on their lower nesting and brooding ranges.

Sage grouse, which are almost completely dependent on sagebrush for food and cover, have been much reduced by elimination of sagebrush for croplands and through loss of natural meadow areas which formerly provided succulent vegetation. They are now experiencing further habitat reduction through extensive sagebrush

eradication programs. Such activity, using chemical and mechanical methods on private, State, and Federal lands has been proceeding rapidly since 1950. On the national forest rangelands and lands administered by the Bureau of Land Management, some key sage areas have been excluded from these programs to protect the sage grouse habitat.

With the advent of dry farming and heavy grazing, only a small amount of prairie grassland remains in the subregion. The one remaining area supporting sharp-tailed grouse has been reasonably stable because the terrain is unsuitable for farming, but highway development activity has been detrimental to sharp-tailed grouse by causing disturbance in the vicinity of a long-established breeding ground.

Absence of free water in much of the sagebrush area is undoubtedly a serious limiting factor for nesting mourning dove. In the few cases where the Idaho Fish and Game Department has installed watering devices for other wildlife, high use of the water by mourning dove has followed immediately. Availability of food also limits dove populations.

The cottontail is limited in large areas by lack of good food and cover. The irrigated lands provide very little brush for nesting and escape cover. The dry farmed areas lack year-round cover and water.

Beneficial Developments Changes in land use which are detrimental to certain species of upland game sometimes result in habitat favorable to other species. Most of the developments favoring upland game are incidental benefits related to irrigation and resultant land use changes. Some benefits, especially to sage grouse, have resulted from development of wildlife habitat as a definite part of the overall plan. Several new irrigated tracts have added pheasant habitat. The resultant benefits balance somewhat the loss of quality which usually accompanies further development of long established irrigated tracts.

Public land management agencies have recently shown interest in adjusting their sagebrush eradication programs to leave some sage for wildlife. The State wildlife agencies in Idaho and Oregon have entered into cooperative agreements with the Bureau of Land Management and the U.S.D.A. Forest Service providing for joint review of all proposed brush eradication projects with a view to preserving sagebrush areas important to sage grouse and other wildlife.

The Idaho Fish and Game Department now controls some upland game range on the Fort Boise Wildlife Management Area and the C. J. Strike Wildlife Management Area (figure 18). Curtailment and control of livestock grazing and farming to produce food and cover have

already resulted in considerable improvement of these areas as wildlife habitat. Additional improvements and management of the areas primarily for the benefit of wildlife will further enhance the habitat for pheasant, quail, and other upland species.

Dove appear to be secure because agricultural lands are expanding with new irrigation projects which provide additional nesting, feeding, and watering situations.

Fur Animals

The fur animals found here include badger, beaver, bobcat, coyote, lynx, marten, mink, muskrat, otter, raccoon, red fox, spotted skunk, striped skunk, weasel, and wolverine. State laws regarding classification of fur animals are not uniform, but the list above includes species which may be expected to reach the fur markets. In addition, some pelts from white-tailed jackrabbit, black-tailed jackrabbit, snowshoe rabbit, and mountain lion may reach the markets.

Habitat

Distribution of fur animals varies according to the habitat. Beaver, muskrat, and mink are found along most streams, lakes, and ponds. Muskrat are abundant mainly in the lower Boise and Payette River valleys while beaver and mink occur mainly on the smaller streams. Otter occur in some of the mountain streams. Raccoon are common along streams, especially in the lowlands. Badger, bobcat, coyote, spotted skunk, striped skunk, and weasel are widely distributed. Red fox are not common in most of the subregion, while lynx and marten are limited to the higher timbered northern areas. Wolverine are scarce but are seen occasionally, usually in timbered areas.

Use

A steady decline of trapping activity since about 1950 has come about because of changes in economic conditions, including the modern mode of life as well as depressed prices for all furs. Recent trapping has been mainly for muskrat, beaver, coyote, bobcat, and mink. The furbearers as a group could produce considerably more fur than is now being marketed annually.

In the 1965-66 trapping season the Oregon portion of the subregion yielded approximately 4,500 pelts which included about 3,700 muskrat, 400 bobcat, 200 beaver, 200 coyote, and less than a hundred pelts of any other single species. In addition, about 1,100 bobcats and over 4,000 coyotes were taken by hunting and other methods. Idaho fur yields in the 1965-66 season totaled nearly 22,000 pelts

which included nearly 20,000 muskrat, over 600 beaver, 375 mink, and smaller numbers of at least nine other species, but mainly bobcat, raccoon, marten, coyote, and red fox. While Idaho trappers took nearly 300 bobcat and about 150 coyote, the unknown numbers of these two species taken in Idaho by other methods were perhaps about equal to the numbers shown above for Oregon. Hunting for bobcat and coyote constitutes a major winter recreation in some localities.

Based upon trappers' reports in Idaho and Oregon, the market value for furs taken during the 1965-66 trapping season was approximately $57,000. Until relatively recent times, most of the trapping pressure was attracted by beaver, mink, and muskrat. However, in recent years bobcat and coyote pelts have taken a prominent place in the fur market. In this area the total value of bobcat pelts taken by trappers in the 1965-66 season was exceeded only by that for muskrat. Trapper income from bobcat pelts was greater than for either beaver or mink. Of the less common species, only otter and lynx attracted a higher price per pelt than bobcat.

Besides their commercial value, the furbearers have wide esthetic appeal and their presence affords great opportunity for educational and scientific purposes in demonstrating principles of ecology to the public. The pleasure which people derive simply by observing wild animals in their natural surroundings probably represents the greatest importance of the fur animals and other nongame animals. As an example, campers and fishermen here sometimes have the thrill of watching otter perform. This certainly heightens the outdoor experience and this opportunity undoubtedly encourages some people to visit the area.

The human benefits to be gained from such outdoor pleasure provide one of the most important reasons why land and water use plans should provide for the maintenance of a diverse and productive natural habitat. Destruction of habitat or elimination of a species of animal represents greater loss than shown by tables of economic value alone.

Factors Affecting Resource

Removal of streamside cover, brush and trees, draining or filling of natural wetlands, channel alterations, overgrazing, and the general clean farming practices on agricultural lands have combined to reduce the total habitat available to furbearers. Pest control programs and improperly planned use of rodenticides and insecticides undoubtedly have been detrimental to furbearers in many instances, but the effects of such operations have usually not been understood nor carefully evaluated. Domestic, agricultural, and industrial pollution of streams has reduced furbearer populations in some local areas.

Maintenance of water levels and pond development on lands managed especially for wildlife have improved furbearer habitat in some instances.

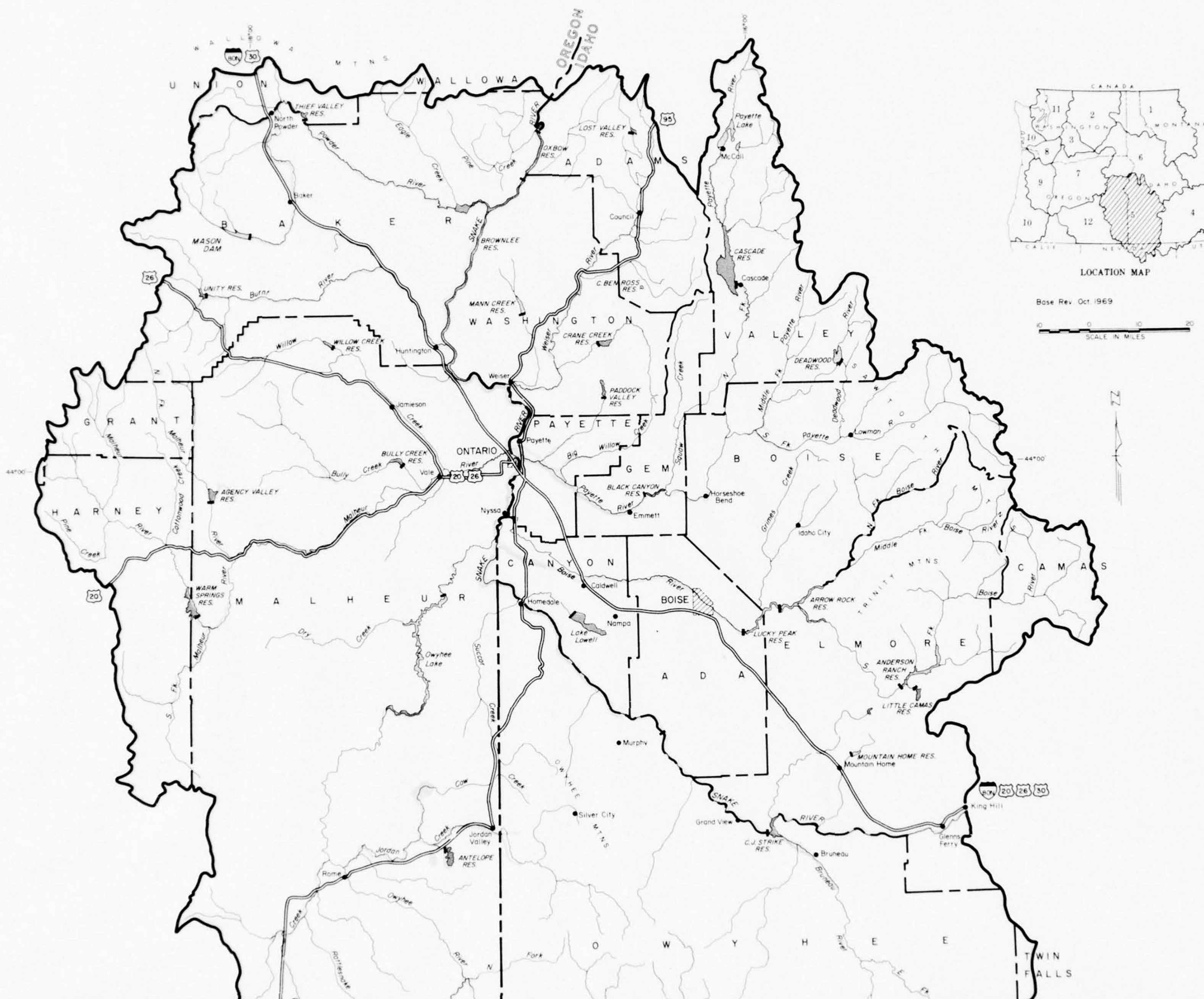
Waterfowl

At least 15 species of ducks occur here during the year. Those known to nest here include mallard, baldpate, green-winged teal, cinnamon teal, blue-winged teal, pintail, American goldeneye, shoveler, and redhead. Other species found here are lesser scaup, ruddy, canvasback, ring-necked duck, bufflehead, and wood duck. The Great Basin Canada goose nests in abundance throughout the lower drainages, and coot also nest here.

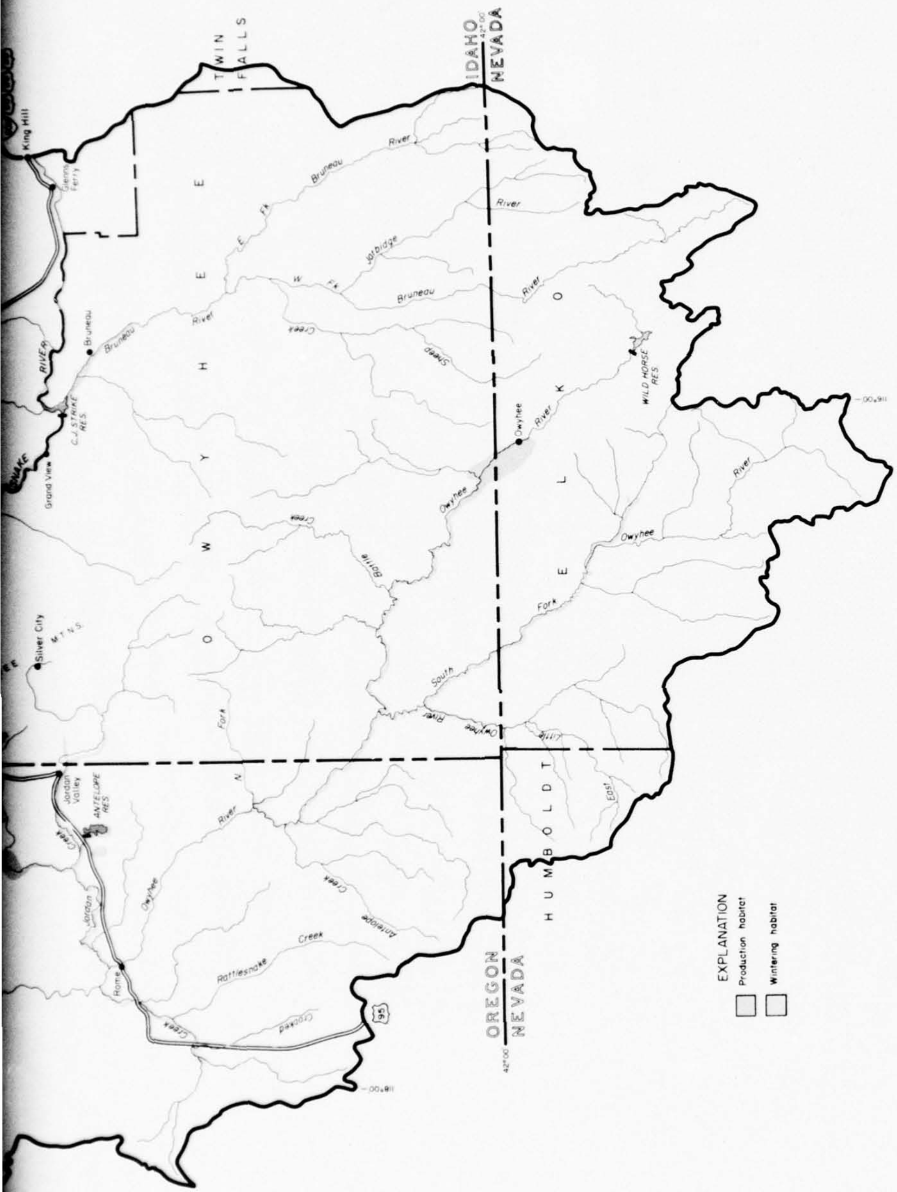
Habitat

Figure 23 outlines the important production and wintering habitat for waterfowl. There are no major duck production sectors here, but there are numerous small wetlands which produce ducks in moderate numbers. These consist of creeks and wet meadows at higher elevations, the Snake River and tributary drainages, the margins of irrigation reservoirs and the drains and canals of the extensive irrigated lands.

Prime goose production habitat. (Idaho Fish and Game Department)



LOCATION MAP
Base Rev. Oct. 1969
SCALE IN MILES
ONTARIO
BOISE
OREGON
IDAHO
UNION
WALLOWA
WALLOWA MTNS
BAKER
ADAMS
WASHINGTON
VALLEY
PAYETTE
GEM
BOISE
CANYON
ADA
ELMORE
CAMAS
GRANT
HARNEY
MALHEUR
OWYHEE
TWIN FALLS
TRINITY MTNS
OWYHEE MTNS
SNAKE RIVER
THIEF VALLEY RES.
MASON DAM
UNITY RES.
BROWNLEE RES.
OXBOW RES.
LOST VALLEY RES.
MANN CREEK RES.
C. BEN ROSS RES.
CRANE CREEK RES.
PADDOCK VALLEY RES.
CASCADE RES.
DEADWOOD RES.
WILLOW CREEK RES.
BULLY CREEK RES.
AGENCY VALLEY RES.
WARM SPRINGS RES.
BLACK CANYON RES.
ARROW ROCK RES.
LUCKY PEAK RES.
ANDERSON RANCH RES.
LITTLE CAMAS RES.
MOUNTAIN HOME RES.
C.J. STRIKE RES.
ANTELOPE RES.
Lake Lowell
Owyhee Lake
Payette Lake
North Powder
Baker
Huntington
Weiser
Council
McCall
Cascade
Lowman
Horseshoe Bend
Idaho City
Emmett
Payette
Jamieson
Vale
Nyssa
Caldwell
Homedale
Nampa
Murphy
Silver City
Grand View
Bruneau
Mountain Home
King Hill
Glenns Ferry
Jordan Valley
Rome
44°00'



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

IMPORTANT WATERFOWL HABITAT

CENTRAL SNAKE SUBREGION 5

1970

FIGURE 23

The subregion contains one Federal waterfowl refuge and two State wildlife management areas which are extensively used by waterfowl. These three areas contain only a small amount of duck production habitat.

The Snake and Payette Rivers have over 200 islands which provide prime goose production habitat. The southwestern Idaho goose flock, which nests and winters almost entirely within this subregion, contains an estimated fall population of about 8,000 birds. This flock, augmented by wintering geese from British Columbia, Alberta, and Montana, supplies goose hunting for large numbers of hunters. Annual nesting surveys and long term banding data accumulated since 1952 have documented the production and movements of this flock.

This area provides wintering quarters for a major segment of the Pacific Northwest mallard population. The mallards which winter here are produced largely in Alberta, Saskatchewan, Montana, and eastern Idaho. Up to 750,000 mallards have been recorded at Lake Lowell in late fall at the peak of migration. The corn and small grains produced in abundance on croplands are the attraction for these waterfowl. Normally, winters are mild here and the birds winter well, fanning out into the open waters along the rivers after the close of the hunting season. Up to 15,000 wintering Canada geese have been recorded in the vicinity of Deer Flat National Wildlife Refuge.

Use

Annual use of waterfowl is estimated at 156,000 hunter-days. An analysis of this use is shown in table 43.

Table 43 - Estimated Annual Hunting Use of Waterfowl, Subregion 5 1/

	Hunter-Days			
Waterfowl Group	Idaho	Oregon	Nevada	Totals
Ducks	99,700	9,750	--	109,450
Geese	37,600	3,350	--	40,950
Coots	5,400	--	--	5,400
Totals	142,700	13,100	--	155,800

1/ Based on 1966 data from Idaho Fish and Game Department, and 1965 data from Oregon State Game Commission. Hunting in Nevada portion of subregion was negligible, hence no estimate.

Annual hunter expenditures amount to about $1,005,000 for waterfowl hunting. Goose hunting opportunity in the Snake-Boise-Payette River complex is especially attractive. Annual expenditures do not show the true or complete resource value, but are one indication of the importance of the resource.

Waterfowl are managed on a flyway basis which involves interstate and international cooperation. There may be some waterfowl species for which additional harvest may be desirable. However, any estimate of capacity for increased use locally would probably be dependent upon use of projected use in other parts of the flyway. Hence, no estimate of the capacity for increased use will be made in this appendix.

Factors Affecting Resource

The primary threat to production habitat is the continuing decrease in riverflows on the Snake, Boise, and Payette Rivers, caused by the long term increase in irrigation withdrawals upstream. This poses a threat to the vital river nesting islands which serve as waterfowl production areas in the spring as well as important hunting sites in the fall of the year. If these lands should cease to be islands because of low water levels they would lose much of their value for goose nesting. The proposed construction of Guffey Dam on the Snake River and Garden Valley Dam on the South Fork of the Payette River, if implemented, will further decrease riverflows and adversely affect the present ideal nesting and hunting situations furnished by these islands.

Detrimental factors for waterfowl include occasional seasonal flooding of nesting habitat and destruction of nesting habitat on islands and stream borders through farming or grazing. Some of the flooding occurs when man manipulates the flow of water for his use.

The Bureau of Sport Fisheries and Wildlife operates a waterfowl refuge which provides habitat and protection to waterfowl but also furnishes public hunting, fishing, and other outdoor recreation. The Idaho Fish and Game Department operates two wildlife management areas which contain waterfowl habitat.

Farm ponds, fish ponds, and irrigation storage reservoirs on private lands, probably provide some useful waterfowl nesting habitat, but this has not been evaluated. The value of these areas for waterfowl nesting is largely dependent upon management of the shoreline and nearby cover. Muskrat houses are sometimes used as nesting places by Canada geese where stable water levels prevail.

Other Wildlife

Many other kinds of wildlife are found in the Central Snake Subregion. Shorebirds are seasonally abundant, and bald eagles commonly winter near the larger streams and reservoirs. Several thousand California gulls form a nesting colony on an island in Lake Lowell, and several other species of gulls are common. Some other groups of birds which are characteristic of this area include marsh birds, colony nesting waterbirds, and several species of hawks and owls. Several species of blackbirds are abundant in marshes and along streams. Resident species whose population status is still undetermined nationally are the ferruginous hawk, American osprey, and prairie falcon.

Marmot, jack rabbit, and hundreds of other wildlife species are of considerable importance. Other species include various rodents and birds, all of which have definite but often undocumented requirements. The variety of wildlife, both game and nongame, is one of the outstanding attributes of this area.

Nongame wildlife is one of the outstanding attributes of this subregion. (Bureau of Land Management)

Habitat

Each kind of habitat is used by one or more wildlife species, but little is known about some of the less extensive types of habitat which support some of the less common species of wildlife. The relatively undisturbed rough lands in this area provide wildlife habitat of special interest to the outdoorsmen who leave the beaten path. The Walters Ferry-Grandview reach of Snake River supports one of the world's greatest nesting concentrations of golden eagle and prairie falcon.

Use

Hunting use data on nongame species generally are not available. Such use in this subregion is estimated to be less than 10 percent as great as hunting for game species. The enjoyment of wildlife through observation and exploration is a use which affects increasing numbers of people. Scientific research also looks toward wildlife as the source of basic biological information which contributes to human culture.

The enrichment of experience which is provided by man's interest in and association with wildlife is an unquestioned value. Mature discrimination and discernment will be needed to protect and perpetuate this value as plans are shaped for future land and water use.

Factors Affecting Resource

Activities such as highway construction, water development, and urban development usually reduce the habitat for various kinds of wildlife. Ill-advised or excessive use of pesticides and herbicides frequently causes wildlife losses either directly or through destruction of habitat. Predator and rodent control activities have often taken animals beyond what could be justified in terms of total public interest.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

Providing fishing and hunting opportunities will require extensive programs integrated with the other uses of land and water.

Fishing

Providing protection and enhancement for stream fisheries is perhaps the foremost fisheries problem. Streams should be protected against channeling. Minimum flows should be established for all streams. Many stream segments could be greatly enhanced by providing a guaranteed minimum flow year round. Water quality standards must be met and enforced.

Attempts to establish self-sustaining runs of both early and late spawning kokanee in a number of the larger irrigation reservoirs will be continued. This will be coupled with rough fish control programs wherever feasible. Other new species will be introduced into suitable environments to provide additional fisheries. Species now included in the introduction program are kokanee, coho salmon, channel catfish, smallmouth bass, and brown trout.

As fishing pressure continues to increase, efforts to purchase or lease areas to provide more public access to fishing waters should be accelerated. Over 69 percent of the Idaho trout stream mileage in the subregion is bordered all or partly by private lands. Public access needs are proportionately greater near population centers. While 31 percent of the stream mileage occurs within Federal lands and is accessible to the fishing public, it should be recognized that these mileage figures include many small mountain streams with relatively low productivity. Larger, more productive streams are generally found in the valleys, associated with agricultural development and private lands.

Habitat Preservation

Maintaining quality fishing for the future will require that the following streams be preserved in their present state, and possibly enhanced, in the interest of resident fish:

Bruneau River - all
Jarbidge River - all
Snake River - from Hammett to east boundary of subregion and from Swan Falls to Walters Ferry
Owyhee River - from Owyhee Dam to first diversion dam and from Lake Owyhee to Wild Horse Reservoir
North Fork Owyhee - all
Middle Fork Owyhee - all
South Fork Owyhee - all
Boise River - all
North Fork Boise - all
Middle Fork Boise - all
South Fork Boise - all
Payette River - all
North Fork Payette - all
South Fork Payette - all

Road construction, logging, grazing, and farming should be done in ways which would eliminate stream siltation. Thus, much habitat would be preserved.

White sturgeon habitat in Idaho should be preserved to save this endangered species.

Table 44 lists water requirements for providing minimum flows for fish and wildlife at selected points.

Table 44 - Minimum Flows For Fish and Wildlife at Selected Points,1/ Subregion 5

Stream	Points	Minimum Flow (cfs)
Snake River	C. J. Strike Dam	6,000
Snake River	Murphy	5,000
S. Fk. Boise River	Anderson Ranch Dam	250
Boise River	Lucky Peak Dam	100
Boise River	Barber Dam	160
Boise River	Notus	400
Owyhee River	Owyhee Dam	35
Jordan Creek	State line	30
Malheur River	Mouth	60
N. Fk. Payette River	McCall	50
Gold Fk. Creek	Roseberry	25
N. Fk. Payette River	Cascade	200
S. Fk. Payette River	Banks	400
Payette River	Horseshoe Bend	600
Payette River	Black Canyon Dam	1,200
Payette River	Payette	1,200
Weiser River	Cambridge	100
Lost Creek	Lost Creek Dam	10
Weiser River	Mouth	150
Snake River	Weiser	9,400
Burnt River	Hereford	40
Powder River	Richland	80
Snake River	Oxbow	7,000

1/ Points represent sites where water development may affect streamflows. Based upon data supplied by Oregon State Game Commission and Idaho Fish and Game Department (Aquatic Life Water Needs in Idaho Streams. IWRB - Planning Report Number 3, Boise, Idaho. 1969.).

Habitat Improvement

Improvement of habitat for resident fish in the Central Snake Subregion should be achieved by treating wastes from industrial and domestic pollution, controlling erosion, maintaining or increasing streamflows, laddering low dams, making structural improvements in streambeds, and by constructing new fishing lakes where they would not be detrimental to fish and wildlife resources. Increased flows should be provided in those streams where present flows are insufficient to maintain quality fisheries. Dam releases should be planned cooperatively for optimum water temperature and flow volume. Adequate conservation pools should be provided in those reservoirs which are subject to severe drawdown. Construction of subimpoundments will be desirable on some fluctuating reservoirs.

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 45. A 15,302-acre Federal wildlife refuge on the Mountain Home Desert could be developed utilizing irrigation return flows from the proposed Southwest Idaho Development Project, at an estimated capital cost of $1,200,000. Plans for non-Federal habitat improvement means are incomplete, and some tentative plans undoubtedly overlap some of the Federal plans. The extent of this overlap is not known. Measures in the table proposed by non-Federal agencies include those mentioned below.

Habitat improvements proposed in the Idaho portion of the subregion by 1980 include the construction of waste treatment facilities for two cities and provision for desirable streamflows in three major stream reaches totaling approximately 119 miles. The proposed waste treatment facilities constitute the major costs. Capital and maintenance costs involved are unknown.

By 1980, 28 miles of stream habitat should be improved using gabions and other structural devices to help mitigate stream channeling losses in Idaho at an estimated capital cost of $20,000. By year 2000 an additional 14 miles of stream would be improved at an estimated capital cost of $10,000.

Habitat improvements proposed in the Oregon portion of the subregion with generally unknown target dates include:

(1) providing increased flows on 53 miles of Powder River and 22 miles of Burnt River,

(2) providing increased flows on 62.75 miles of Goose Creek, North Powder River, Wolf Creek, Pine Creek, Clear Creek, and East Pine Creek, which would also require fish passage over 52 low dams on the latter four streams,

Table 45 - Fish Habitat Improvement Means, Subregion 5

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Stream improvement	mile	100	114.0	130	154.0	130	154.0
Spawning bed improvement	mile	30	45.0	50	60.0	90	108.0
Rough fish removal (streams)	mile	2,325	5.8	1,538	3.1	1,598	3.2
Rough fish removal (lakes)	acre	9,596	9.6	9,910	8.9	10,585	8.5
Stream channel preparation	mile	30	30.0	40	140.0	58	232.0
Lake improvement	acre	1,750	875.0	2,270	1,140.0	2,240	1,120.0
Sub-totals			1,079.4		1,506.0		1,625.7
Planning							
Fish stream surveys	mile	780	18.0	Not available		Not available	
Fish lake surveys	acre	2,310	12.0	Not available		Not available	
Sub-total			30.0				
Total			1,109.4				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Stream improvement	mile	68	255	54	291	--	--
Nongame fish control							
Stream	mile	200	125	200	125	--	--
Lake	each	1	125	--	--	--	--
Fish passage improvements	each	59	2,162	--	--	3	450
Fish lakes	acre	300	328	300	328	--	--
Minimum pools in reservoirs	each	3	600	--	--	--	--
Improved flows	mile	257	26	--	--	--	--
Sub-totals			3,621		744		450
Planning							
Fish stream surveys	mile	1,148	29	Not available		Not available	
Fish lake surveys	acre	30,000	150	Not available		Not available	
Sub-total			179				
Total			3,800				

(3) laddering the Phillips-Ingle Diversion Dam so that fish may reach Goose Creek and West Eagle Creek, at an estimated capital cost of $22,000 and annual maintenance of $2,200,

(4) making structural improvements (mainly gabions) in 60.5 miles of streambed in Powder River, Goose Creek, Big Creek, East Pine Creek, North Pine Creek, McCully Fork, and Cracker Creek at an estimated capital cost of $507,300 and annual maintenance of $50,400,

(5) constructing three new lakes on West Fork Pine Creek, Blue Canyon Creek, and Trout Creek, totaling over 300 acres at an estimated capital cost of $328,000 with little annual maintenance, and

(6) manipulating water at Thief Valley Reservoir to supply a 200-acre minimum pool to over-winter trout.

Inclusion of catch basins at irrigation outflow points to settle soil particles carried in return flows would improve water quality in Snake, Boise, Payette, Owyhee, Weiser, and Malheur Rivers. Treatment for removal or neutralization of fertilizer and pesticides carried by irrigation return flows may be feasible at these basins. Waterfowl benefits would probably accrue.

Greater Harvest

With the exception of back country alpine lakes within the subregion, most waters are receiving heavy fishing pressure. Accessible trout streams require maintenance stocking of hatchery fish. Greater harvest of warmwater fish could be made. Public access to 50 percent of the streams presently controlled by adjacent private landowners should be acquired by 1980 at an estimated capital cost of $1.1 million and the remainder by the year 2000 at an estimated cost of $2 million.

Augmentation of Supply

Introduction of suitable species in the large reservoirs within the subregion and channel catfish in the Snake River upstream from C. J. Strike Dam will provide added fishing opportunity. Facilities should be expanded to supply additional hatchery fish in future years. Increased effort in control of rough fish populations will help to augment rising needs. Rough fish control should be accomplished in 200 miles of the Boise and Payette Rivers and in Anderson Ranch and Cascade Reservoirs. Potential reservoir sites should be developed when it is shown that developments will not conflict with existing quality stream fisheries.

Surplus anadromous fish returning to the Rapid River and Pahsimeroi ponds could be transplanted to the Boise and Payette Rivers for sport fishing. Hatcheries will be needed following the reestablishment of anadromous fish runs where passage over dams is not feasible. Recapture of Brownlee-Oxbow and Hells Canyon Dams when the Federal Power Commission licenses expire will allow the reestablishment of salmon and steelhead runs upstream from these dams.

Hunting

Important deer and elk winter ranges are mainly in the valleys and foothills between 3,500 and 6,500 feet elevation. Improved range management, including browse planting, will be most effective if done in this elevational range. Reservation of big game winter range, and development of selected sites thereon, possibly by sprinkler irrigation, offers the main potential for meeting future needs.

Future hunting of upland game will depend upon retaining and improving useful habitat on forest and range lands, and planned management of habitat on agricultural lands and on lands interspersed with agricultural lands. Where irrigation makes it possible to cultivate areas which were previously in native grass or timber, the hunting of upland game will shift toward the species found on agricultural lands.

Fur animals can be maintained and perpetuated as a product associated with programs designed mainly for fish and various groups of wildlife. Water resource planning should contribute importantly to fur animal habitat by maintaining protective cover along canals and streambanks. Control of seasonal water levels in impoundments could also contribute materially to maintaining useful habitat for fur animals.

Small sanctuaries and feeding areas, interspersed with hunting areas, should be provided to obtain better control of waterfowl movements and better distribution of the waterfowl harvest. An extensive pattern of hunter distribution should be possible through leasing or purchasing of lands to provide hunting areas and access to huntable areas. Retention of suitable parcels of land in areas opened to agriculture by new irrigation developments will provide some waterfowl production habitat.

Habitat improvement on State and Federal wildlife areas will have a major part in controlling waterfowl movements by providing additional waterfowl food and resting areas.

Habitat preservation and development will be emphasized in wetland areas threatened by drainage or other uses. This will

involve purchases of key areas as opportunities and funds permit. Approximately 10,000 acres of land will be needed for wetland preservation and development. There is excellent potential for such development in the Boise and Payette River valleys.

Some waterfowl production on private lands will result from irrigation in newly developed areas. Consideration for wetlands on private lands useful to waterfowl can be increased by providing financial assistance to land operators.

Lands managed primarily for game will also benefit many species of nongame wildlife. Programs to benefit nongame wildlife will be incorporated into municipal, suburban, and recreation area plans.

Some water developments offer special opportunities to provide habitat needed by threatened species. For example, the upper parts of Lucky Peak and Arrowrock Rservoirs should be considered when management plans are formulated to benefit bald eagle and perhaps other nongame species.

Habitat Preservation

Present wildlife habitat must be retained and kept available to wildlife to meet future needs. This includes big game range, upland game habitat, protective cover along canals and streambanks useful to fur animals and other wildlife, waterfowl production habitat, and wetland habitat used by fur animals and other wildlife in addition to waterfowl. In some instances land acquisition will be necessary, but agreements covering the use and maintenance of habitat will suffice in many cases. Total land acquisition needs and costs are unknown, but they include acquisition of 25,000 acres of big game winter range and 30,000 acres for upland game, waterfowl, and fur animals in Idaho by 1980 at an estimated capital cost of $7,750,000 and an annual operation and maintenance cost of $91,500. The potential for development of a 15,309-acre national wildlife refuge on the Mountain Home Desert by year 2000 has been identified in connection with the unauthorized Southwest Idaho Development Project. This scheme would utilize irrigation return flows to establish a 5,000-surface-acre marsh. The estimated land acquisition cost would be $190,000; marsh development cost, $1,010,000. This potential for waterfowl would be realized only if the irrigation proposal materializes. The flood plains between offset levees along the lower Boise and Payette Rivers should be zoned for wildlife areas, recreation areas, and parks. In Oregon, proposals include acquisition of 10,000 acres of big game range and 20,120 acres of land for upland game.

Essential habitat should be preserved to maintain the nesting populations of golden eagle and prairie falcon in Snake River Canyon from Grandview to Walters Ferry. Establishment of the proposed Snake River Birds of Prey Natural Area would provide maximum protection for the unique raptor nesting population.

Habitat Improvement

Needed habitat improvement should be accomplished by constructing fences, dikes, ditches, potholes, nesting structures, and watering devices, and by planting food and cover.

Projected wildlife habitat improvement means by Federal and non-Federal agencies are included in table 46. Plans for non-Federal habitat improvement means are incomplete, and some tentative plans undoubtedly overlap some of the Federal plans. The extent of this overlap is not known. Measures in the table proposed by non-Federal agencies include those mentioned below.

Proposals for non-Federal habitat improvement measures by 1980 in Idaho include construction of 50 miles of fence, 25 miles of dikes to form shallow impoundments, 15 miles of ditches and canals, 250 potholes, and 400 nesting structures. These improvements will entail a capital cost estimated at $718,000. Operation and maintenance will cost about $38,500 annually. Plantings to provide food and cover by 1980 are proposed for 19,000 acres of Idaho land and 5,000 acres of marsh at a capital cost estimated at $800,000 with annual operation and maintenance costs of $23,000. Cooperative measures proposed by non-Federal agencies (on Bureau of Land Management lands) include construction by 1980 in Idaho of 150 wildlife watering devices at an estimated capital cost of $38,000 and annual maintenance estimated at $1,400.

Improvement of big game range should include provision for irrigating 10,000 acres of winter range, if proved feasible. Fifty miles of fence should be constructed to protect big game winter range and other key areas. Drift fences should be provided as integral parts of effective passageways needed to permit big game migrations to cross freeways and reservoirs. Increased range productivity, resulting from improved livestock management on State and private lands, would benefit wildlife materially.

Oregon non-Federal wildlife habitat improvement proposals include:

(1) construction of 80 miles of fence and 250 guzzlers,

(2) habitat improvement on 55,000 acres of big game range and 20,140 acres of upland game and waterfowl lands,

Table 46 - Wildlife Habitat Improvement Means, Subregion 5

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Seeding and planting	acre	4,950	299.0	6,380	386.0	6,370	386.0
Forage release & prescribed burning	acre	21,650	51.5	81,950	229.4	82,100	228.0
Key area fencing	mile	20	24.0	30	34.0	10	10.0
Permanent openings	acre	680	53.0	880	68.0	870	67.0
Wildlife food crops	acre	140,330	2,455.8	71,900	898.8	150,100	3,002.0
Guzzlers	each	10	10.0	20	20.0	--	--
Shallow impoundments and marsh improvement	acre	7,480	353.3	9,425	1,215.0	2,500	128.0
Develop potholes	each	10	5.0	20	10.0	10	5.0
Develop nesting facilities	each	10	1.0	10	1.0	--	--
Sub-totals			3,252.6		2,862.2		3,826.0
Planning							
Big game range analysis	acre	830,000	83.0	Not available		Not available	
Upland game habitat surveys	acre	2,700,000	108.0	Not available		Not available	
Habitat management plans	each	50	22.0	Not available		Not available	
Sub-total			213.0				
Total			3,465.6				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement 1/	acre	204,180	6,212	1,010,000	26,500	506,000	13,900
Fencing	mile	1,186	1,437	1,075	1,250	75	94
Watering facilities	each	600	488	--	--	--	--
Marsh development 2/	acre	7,500	918	5,000	300	5,000	300
Food plantings	acre	5,000	165	--	--	--	--
Development on 5% of new irrig. lands	acre	97,500	98	106,000	106	123,000	123
Financial assistance program for private lands	acre	--	--	unknown	1,500	unknown	2,000
Sub-totals			9,318		29,656		16,417
Planning							
Big game range analysis	acre	3,170,000	317	Not available		Not available	
Upland game habitat surveys	acre	19,869,000	800	Not available		Not available	
Sub-total			1,117				
Total			10,435				

1/ Includes cover plots, shallow impoundments, and other items.
2/ Includes ditches, dikes, potholes, and nesting facilities.

(3) development of 200 springs or waterholes, and

(4) development of 2,000 acres of waterfowl marsh.

Marsh development and irrigation of food and cover plantings on lands managed primarily for wildlife will require that water be made available for these purposes.

Detailed estimates of habitat improvement needs or estimated costs on private lands are not available. Such costs would undoubtedly exceed those estimated for improvements on State and Federal lands.

A significant amount of habitat improvement could be accomplished by obtaining adequate game harvest and development of better livestock management programs.

Upland game in newly developed agricultural areas can be a continuing crop if 5 percent of the land is held in public ownership specifically for upland game habitat and for public use in hunting or other recreational activities. Providing for hunting and other recreational use of lands in agricultural areas at public expense has seldom been possible under the traditional system of private land ownership. However, there is now an opportunity to supply a public need by designing the pattern of land ownership and land use so that land for upland game habitat will be provided in much the same way that land has been made available for public roads in the past. During the era of development of newly watered lands, this could be done simply by retaining portions of each area in public ownership when title on the remainder is passed to private ownership. It is in the public interest that lands be made available for wildlife use.

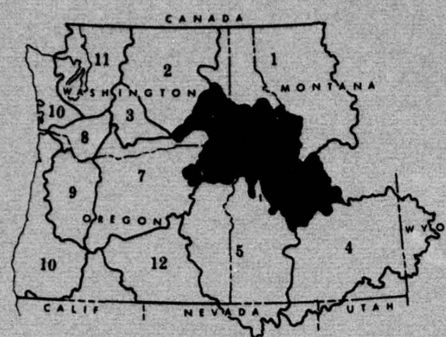
Greater Harvest

If present game ranges remain available, mule deer and upland game can support large increases in hunting in the future. A moderate increase in elk hunting is anticipated. Other big game species will support only minor increases. The additional hunting of deer and elk will be achieved largely through refined management which will permit a maximum annual harvest. The base for greatly expanded hunting of deer exists mainly in areas which are remote from centers of human population. Not much additional deer hunting can be expected in the future if major winter ranges are lost to other uses. Harvest above the present level will require that existing habitat be retained and that habitat improvement be accomplished. Increased upland game harvest could be realized in some areas by providing access.

Hunting access improvements proposed in Idaho include 50 miles of roads, 10,000 acres of upland game range opened to hunting by permission, and 50 facilities including blinds and boat docks. These improvements will cost an estimated $308,000 with annual maintenance costs of about $10,000. In Oregon, provision of public access for big game hunting is proposed for three townships.

Augmentation of Supply

Artificial production is not feasible for providing supplies of big game for public hunting. Hence, it is not expected to become a significant part of the big game program. Measures discussed under the three preceding headings may increase the supply of wild stocks of upland game and waterfowl without augmentation by artificial production. Most projects that increase supplies of game will also increase supplies of fur animals and other wildlife.



LOCATION MAP

SUBREGION 6

SUBREGION 6, LOWER SNAKE

GENERAL DESCRIPTION OF SUBREGION

Lower Snake--a subregion with many fish and wildlife values. (Idaho Fish and Game Department)

The 35,080 square mile Lower Snake Subregion includes the rugged back country of central Idaho and portions of southeastern Washington and northeastern Oregon. The clear, cold waters from melting snowpacks descend from the high mountain ranges creating the headwaters of the Salmon and Clearwater Rivers which join the Snake River before meeting the Columbia near Pasco, Washington, at the western edge of the subregion.

The famous "River of No Return" and the Nation's largest contiguous area of wilderness are located in the eastern portion of the subregion. The rugged Salmon and Clearwater drainages offer the wilderness visitor a unique experience in their unspoiled vastness. Agriculture is the predominant use of the less rugged terrain of the subregion's western portions.

The wide range in elevation (350-10,000 feet) plus the effect of slope exposure in the more rugged country, produce many climatic conditions and vegetation types. These provide habitat for a variety and abundance of fish and wildlife species. The quality and remoteness of the habitat in the eastern portion of the subregion enable the survival of some species which have disappeared from other portions of the Columbia-North Pacific Region.

HISTORY OF FISH AND WILDLIFE

As in the other Snake River subregions, the abundance and variety of fish and wildlife were important to the early inhabitants of this area. Even today, these resources are invaluable for the food and recreation they provide.

Historically, the rivers teemed with anadromous fish (salmon and steelhead) during their migrations. Dolly Varden, cutthroat trout, rainbow trout, white sturgeon, and mountain whitefish were native to these waters. Nongame fish such as sucker and squawfish were present but did not constitute a significant problem as they do now.

The vast wilderness was a haven for many wildlife species. Elk, bighorn sheep, mountain goat, moose, mule deer, and, in the lower elevations, white-tailed deer flourished. Bison and pronghorn antelope occurred in portions of the subregion as did the great predators--cougar, wolf, and black and grizzly bear.

Upland game consisted of forest grouse (blue, spruce, and ruffed), mountain quail, sage grouse, sharp-tailed grouse and mourning dove. Waterfowl were abundant along the rivers and associated wetlands in the lower portion of the drainage.

Fur animals--marten, fisher, mink, and beaver--thrived in the wilderness. Fur trappers and, later, market hunters (supplying mining camps) were the first white men to exploit the fish and wildlife resources. Other activities such as farming, ranching, and logging produced vast changes in the habitat. Highway and canal construction and urbanization occupied more land. Air and water pollution changed the quality of much of the remaining habitat.

The remaining wilderness area of this subregion is one of the last strongholds in the nation for elk, cougar, bighorn sheep, and other wilderness dwellers.

Power dams and reservoirs on the Columbia and Snake Rivers created barriers to anadromous fish, resulting in deterioration

of the runs. Fish passage facilities, hatcheries, and other measures have perpetuated the anadromous fish runs in the Salmon, Clearwater, and lower Snake drainages. However, these runs continue to be threatened by more dam construction, irrigation diversion, and siltation of spawning grounds. Reservoirs behind power dams on the Snake River adversely affected some of the areas used by white sturgeon. Rough fish found the reservoirs favorable spawning grounds and increased, resulting in competition with game fish populations in the lower portions of the drainages.

The late 1800's and early 1900's saw man's first attempts to regulate harvesting of fish and wildlife in this subregion. New species were introduced, including ring-necked pheasant, bobwhite, valley and Gambel's quail, chukar, Hungarian partridge, and wild turkey.

Fish introduced include the brown, brook, and golden trout; smallmouth and largemouth bass; black crappie; pumpkinseed; yellow perch; channel catfish; brown and black bullhead; and carp.

The Lower Snake Subregion has experienced a rich history in which fish and wildlife have played an important role. The large expanse of wilderness and the variety and abundance of fish and wildlife are among the subregion's most valuable assets.

PRESENT STATUS

The fish and wildlife in the Lower Snake Subregion comprise anadromous fish, resident fish, big game, upland game, fur animals, waterfowl, and other wildlife. All of these resources are of recreational, economic, and esthetic significance. The big game species in the remote and relatively inaccessible areas are especially notable. Big game hunting and the fisheries for anadromous and resident fish combine to make this an area of outstanding national significance. Capacity for increased use exists mainly in deer hunting, elk hunting, upland game hunting, and fishing for resident fish.

State fish hatcheries, State wildlife management areas, big game ranges, Federal hatcheries, and national wildlife refuges and big game ranges are located and identified on figure 24. All of these facilities and lands are of special value to one or more kinds of fish and wildlife.

Anadromous Fish

Anadromous fish are of great importance in this subregion; however, most of the production is harvested in other areas. Because of the widely dispersed harvest of subregion stocks of fish, a regional analysis is presented in the "Regional Summary."

FIGURE 24. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	Ice Harbor Dam Wildlife-Recreation Area	360	
2	Turnbull Nat'l. Wildlife Refuge	17,171	
3	Stubblefield Wildlife-Recreation Area	840	
4	Tucannon Fish Hatchery		17,200
5	Wm. T. Wooten Wildlife-Recreation Area	11,235	
6	Asotin Wildlife-Recreation Area	4,445	
7	Spring Valley Dam Public Fishing Area	296	
8	Elk River Dam Public Fishing Area	407	
9	Winchester Lake Public Fishing Area	292	
10	Waha Lake Public Fishing Area	32	
11	Wenaha Game Management Area	9,290	
12	Morgan Lake Fishery Management Area	63	
13	Ladd Marsh Game Management Area	2,224	
14	Wallowa Fish Hatchery		30,575
15	Chamberlin Basin segment 1/	407	
16	South Fork Salmon River segment 1/	4,625	
17	Big Creek segment 1/	2,080	
18	Middle Fork Salmon River segment 1/	1,106	
19	North Fork Salmon River Hatching Channel 2/		
20	Jimmy Smith Lake Public Fishing Area	32	
21	Circle C Hatchery		60,000

1/ Big game winter range acreage in or adjacent to Idaho Primitive Area.

2/ Experimental facility.


WASHINGTON
IDAHO
WASHINGTON
OREGON
OREGON
IDAHO
MONT.
IDAHO
LINCOLN
SPOKANE
CHENEY
WHITMAN
ADAMS
FRANKLIN
WALLA WALLA
COLUMBIA
GARFIELD
ASOTIN
NEZ PERCE
LATAH
LEWIS
SHOSHONE
CLEARWATER
IDAHO
UMATILLA
UNION
WALLOWA
ADAMS
VALLEY
CUSTER
BLAINE
Sprague
Sprague Lake
Rock Lake
Rock Creek
Palouse River
PULLMAN
MOSCOW
LOWER GRANITE
LITTLE GOOSE
LOWER MONUMENTAL
ICE HARBOR
Snake
Tucannon
Pomeroy
Clarkston
LEWISTON
Asotin Creek
Orofino
DWORSHAK RES.
North Fork Clearwater
Lochsa River
Selway River
Kamiah
Kooskia
Craigmont
Cottonwood
GRANGEVILLE
White Bird
Salmon River
Riggins
Little Salmon River
New Meadows
HELLS CANYON
Grande Ronde River
LA GRANDE
Union
Elgin
Wallowa River
Enterprise
Wallowa Lake
Imnaha
Little Sheep Creek
Joseph Creek
SALMON RIVER MOUNTAINS
Yellow Pine
Big Creek
Stanley
Redfish Lake
East Fork Salmon
EXPLANATION
STATE FISH FACILITY
FEDERAL WILDLIFE AREA
STATE WILDLIFE AREA
Base Rev Oct. 1969

AD-A036 559 PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6
COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)
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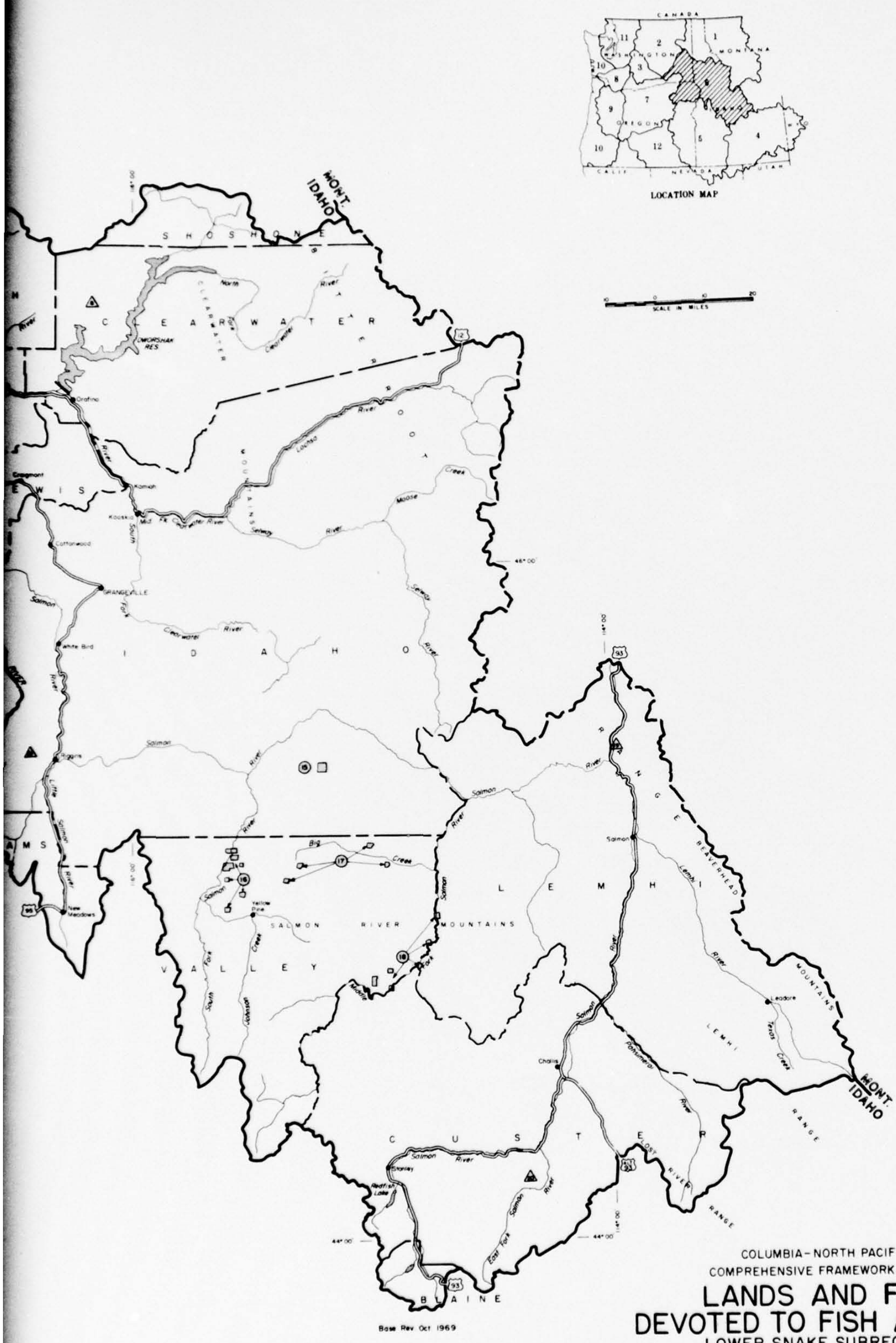


COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

LOWER SNAKE SUBREGION 6

1970

FIGURE 24

Resident Fish

Dolly Varden and rainbow, cutthroat, and brook trout are the principal resident salmonids. Rainbow trout, cutthroat trout, and mountain whitefish are widely distributed. Kokanee are native to lakes of the Stanley Basin. Golden trout have been introduced, mainly in selected high mountain lakes. Sturgeon are found in the lower Snake River. Other fish which provide sport fishing include smallmouth bass, largemouth bass, crappie, perch, bluegill, channel catfish, and brown bullhead. Other fish which occur here include sucker, squawfish, carp, chiselmouth, chub, shiner, dace, sculpin, and Pacific lamprey.

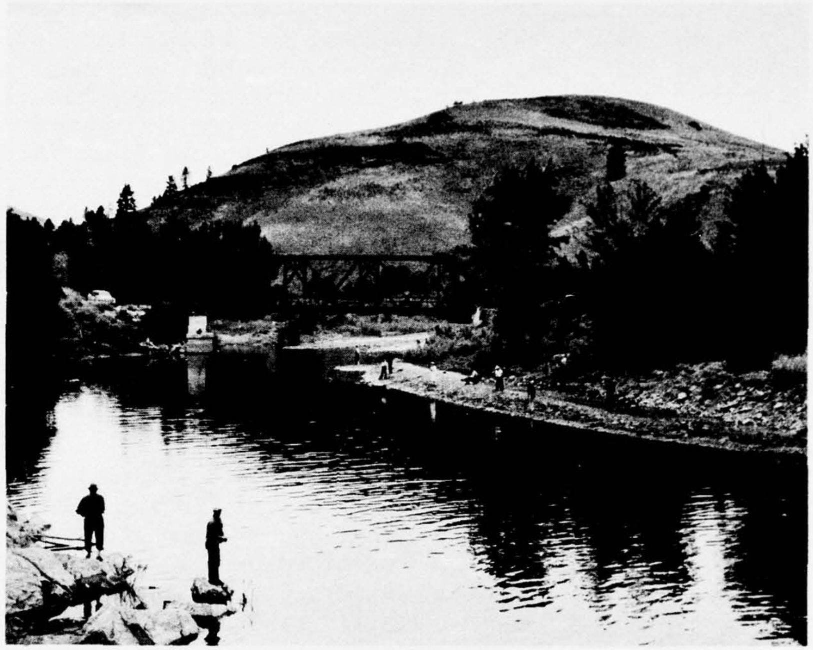
Habitat

Habitat for resident fish includes many clear, cold, small streams in the higher elevations, more than 1,000 natural mountain lakes, a few reservoirs, and large rivers in the lower valleys. Total water area is about 80,500 acres. This excludes the impoundment of 16,970 surface acres which will eventually be created upstream from Dworshak Dam, now under construction. There are about 6,900 miles of stream. In addition, waters on private lands include a minimum of 2,854 farm ponds, 201 stocked fish ponds, 37 managed fish ponds, and 48 irrigation storage reservoirs.

Stream classifications are available for 4,237 miles of Idaho streams, as shown in figure 25. Idaho stream classification is based upon esthetics, availability, use, productivity, and size. Special consideration was given to unique or endangered species, anadromous fish, vital spawning areas, stream potentials, and enhancement possibilities. Class 1 streams are those having multi-state value. They include any stream portion containing or having reasonable potential for anadromous fish, endangered species, unique populations of wild fish, or containing spawning area vital to perpetuation of lake or reservoir populations. Class 2 includes streams of value to large districts of the State. Class 3 streams are those of value to small districts, such as counties. Class 4 streams are those of restricted local value. Classifications for 4,237 miles of Idaho streams in the subregion include 1,856 miles of Class 1 streams, 653 miles of Class 2 streams, 1,292 miles of Class 3 streams, and 436 miles of Class 4 streams.

Use

Annual sport fishing use is estimated at 686,000 fisherman-days. Trout fishing provides over 90 percent of the total fishing activity, but fishing for warmwater species, including sturgeon, is important in the Snake River between Hells Canyon Dam and Lewiston, Idaho. Sport fisherman use for streams, lakes and ponds, and reservoirs is shown in table 47.



Resident fish support a growing angler pressure. (Idaho Fish and Game Department)

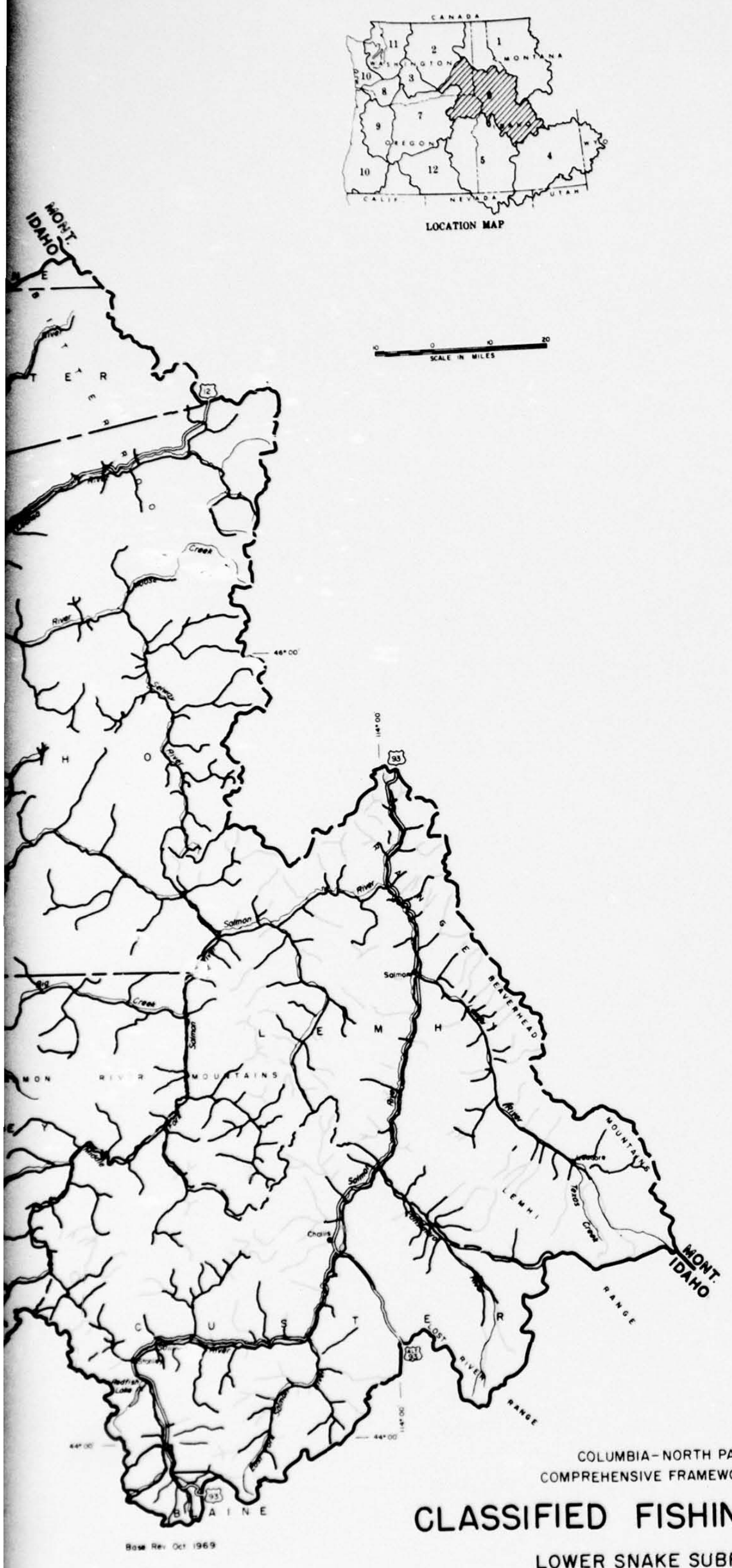
Table 47 - Estimated Annual Sport Fishing
Use of Resident Fish, Subregion 6

Waters	Angler-Days			
	Idaho 1/	Oregon 2/	Washington 3/	Totals
Streams	111,322	22,200	78,619	212,141
Lakes and Ponds	60,950	66,600	253,643	381,193
Reservoirs	70,900	22,200	4/	93,100
Totals	243,172	111,000	332,262	686,434

1/ Idaho Fish and Game Department data, 1966.
2/ Oregon State Game Commission data, 1965.
3/ Washington Department of Game data, 1966.
4/ Reservoirs included with lakes and ponds.

WASHINGTON
IDAHO
MONT.
IDAHO
WASHINGTON
OREGON
OREGON
IDAHO
LINCOLN
SPOKANE
WHITMAN
ADAMS
LATAH
SHOSHONE
CLEARWATER
FRANKLIN
WALLA WALLA
COLUMBIA
GARFIELD
ASOTIN
NEZ PERCE
LEWIS
IDAHO
UMATILLA
UNION
WALLOWA
ADAMS
VALLEY
LEMHI
CUSTER
BLAINE
SALMON RIVER MOUNTAINS
CHENEY
PULLMAN
MOSCOW
Clarkston
LEWISTON
GRANGEVILLE
LA GRANDE
ICE HARBOR
LOWER MONUMENTAL
LITTLE GOOSE
LOWER GRANITE
DWORSHAK RES
HELLS CANYON
SNAKE
RIVER
46° 00'
44° 00'
EXPLANATION
Streams of nationwide importance
Streams of statewide importance
Streams of countywide importance
Streams of local importance
Base Rev Oct 1969

2



COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

CLASSIFIED FISHING STREAMS

LOWER SNAKE SUBREGION 6

1970

FIGURE 25

The combination of high mountain lakes and large rivers with clear tributaries, many flowing from vast primitive areas, makes this subregion of special appeal to fishermen. Quality trout fishing in scenic surroundings is available here to those who are willing to exert the effort to reach areas where access is difficult. Sturgeon and bass fishing in the Snake River is nationally famous. The exceptional esthetic values related to fishing in the entire Lower Snake Subregion probably exceed the economic values by which this resource use is commonly measured. Anglers spent an estimated $3,432,000 fishing for resident fish in 1965.

Fishing capacity (fisherman use which the resource could sustain at the present rate of success) is unknown but considered to be above present levels. Difficult or limited access restricts use of many waters.

Factors Affecting Resource

The detrimental factors are mainly practices which affect the water quality, the status of the channels, or the water supply. Silting is widespread, particularly in the Salmon and Clearwater River tributaries, in the Palouse and Lochsa River tributaries, and in the Selway River tributaries downstream from Meadow Creek. Road building associated with logging causes silting of many streams, but agricultural development, overgrazing, mining, logging, and highway and other road construction cause erosion that results in siltation.

Dworshak Reservoir will destroy much stream habitat. Dredge mining has damaged the fish resource, especially in the Palouse River, Orofino Creek, Orogrande Creek, South Fork Clearwater River, and Yankee Fork of Salmon River.

The natural productivity potential of many streams has been greatly reduced by physical alterations to channels. Road encroachment, which has contributed most to degradation of streams, has been extensive, particularly on tributaries of the South Fork Clearwater River. Stream alterations caused by mining have affected more streams in the Clearwater drainage than in other areas.

There is relatively little domestic pollution of streams, compared to some other subregions, but mining pollution is a common problem here.

The most common practice affecting the water supply during the summer months is dewatering of streams for irrigation. Water regulation for other purposes, and power drawdowns, also create water supply problems for the resident fishery.

Poor pool to riffle ratios limit the productivity of many of the smaller streams. Undesirable fish and the lack of suitable public access are local problems of less consequence in much of this subregion than in most other areas.

Beneficial developments and programs include rough fish control followed by stocking of suitable species, creating small impoundments specifically to provide a local fishery, providing public access to fishing, and introduction of species of fish new to the area. New species introduced locally include golden trout, coho salmon, brown trout, channel catfish, smallmouth bass, and grayling. Industrial and municipal pollution abatement is progressing in various areas. Fish screens, installed in irrigation canals on the Salmon River drainage primarily to retain anadromous species, have benefited resident species as well.

In the year ending September 30, 1965, a total of 151,702 pounds of fish, mostly rainbow trout, were stocked in waters of this subregion.

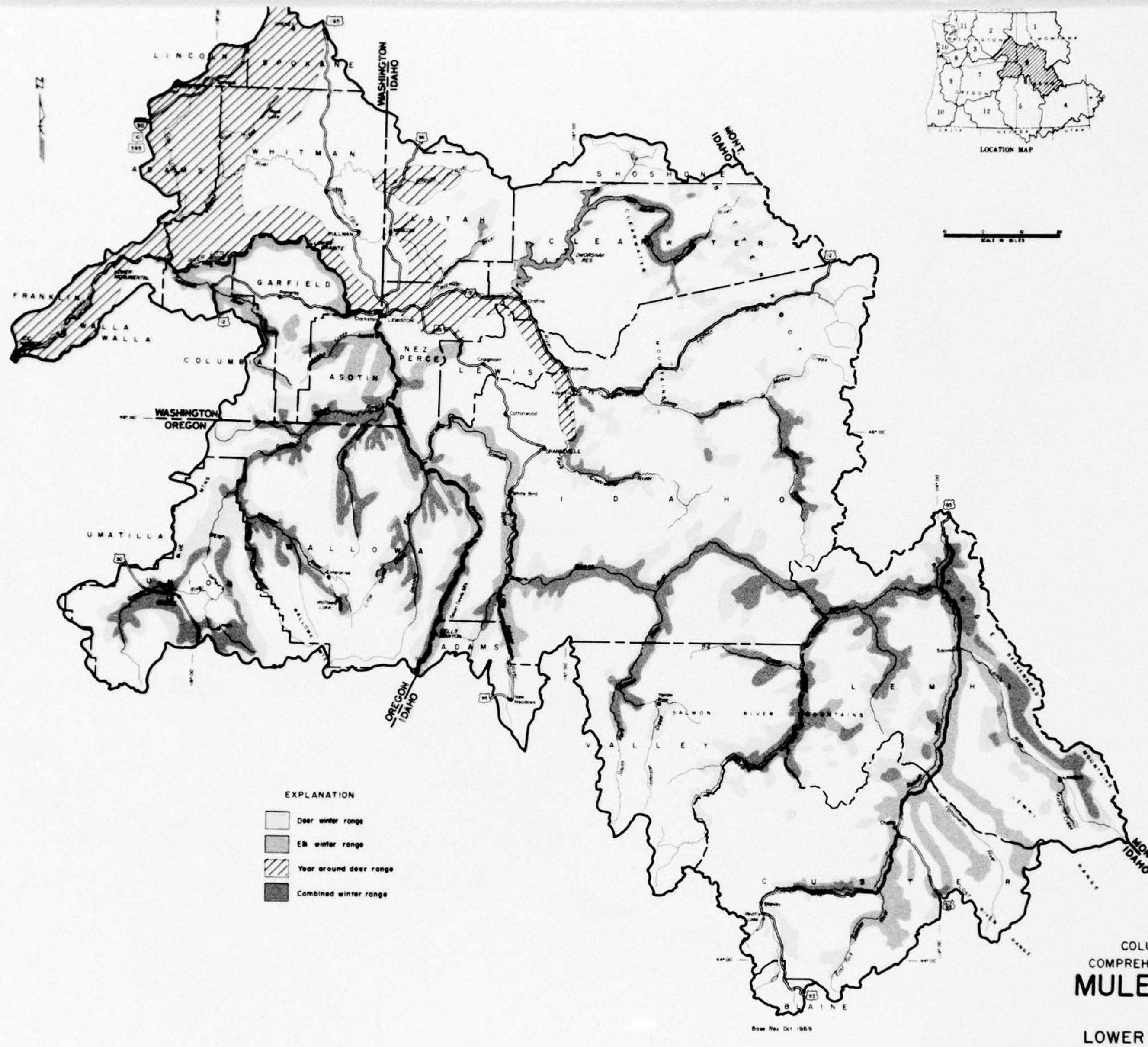
Some of the farm ponds, fish ponds, and reservoirs mentioned earlier under "Habitat" have been developed so that they contribute to the fishery resource.

Big Game

Big game species found here are elk, mule deer, white-tailed deer, moose, pronghorn antelope, bighorn sheep, mountain goat, mountain lion, black bear, and possibly grizzly bear. Figure 26 shows winter ranges for mule deer and elk. Ranges for white-tailed deer and pronghorn antelope are shown on figure 27. Figure 28 shows the general ranges of moose and bighorn sheep. Ranges are not shown for the other big game species since their distribution is rather limited and detailed information on their seasonal distribution is not available.

Habitat

Big game habitat includes some of the most rugged and inaccessible mountain country in the nation. It also includes the lower mountains and timbered hills which extend into the agricultural lands of the Palouse area of Idaho and Washington, plus the sage-covered foothills and valleys in the semi-arid areas which surround the headwaters of some of the southeastern tributaries of the Salmon River. Annual precipitation exceeds 40 inches in parts of the Clearwater drainage, and much of the higher country receives average annual snowfall in excess of 55 inches. Where precipitation is abundant the vegetation, which provides big game food, grows rapidly and develops dense cover. The abundant growth has made possible the great game herds for which the Clearwater drainage is noted.



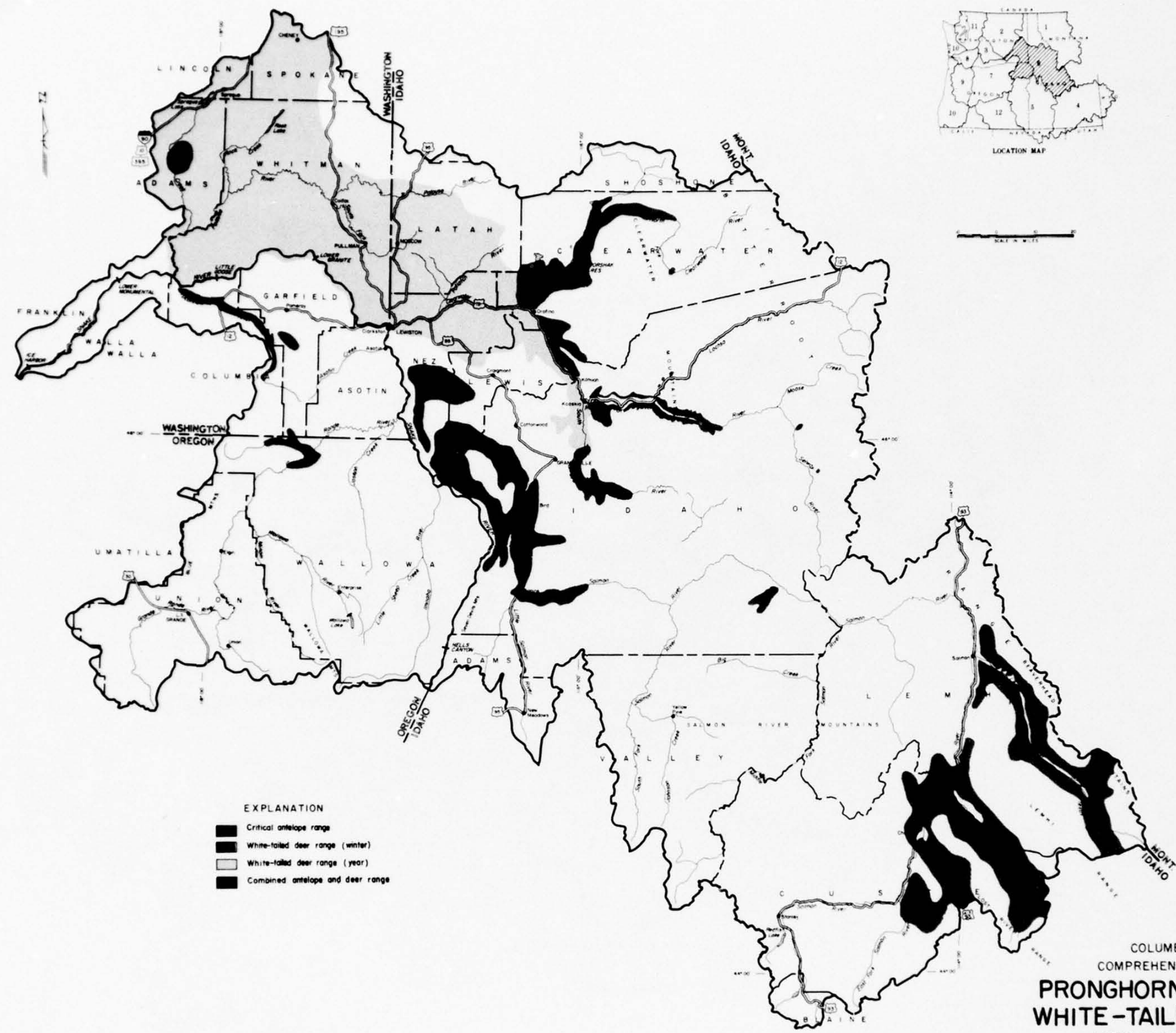
COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

MULE DEER AND ELK RANGES

LOWER SNAKE SUBREGION 6

1970

FIGURE 26



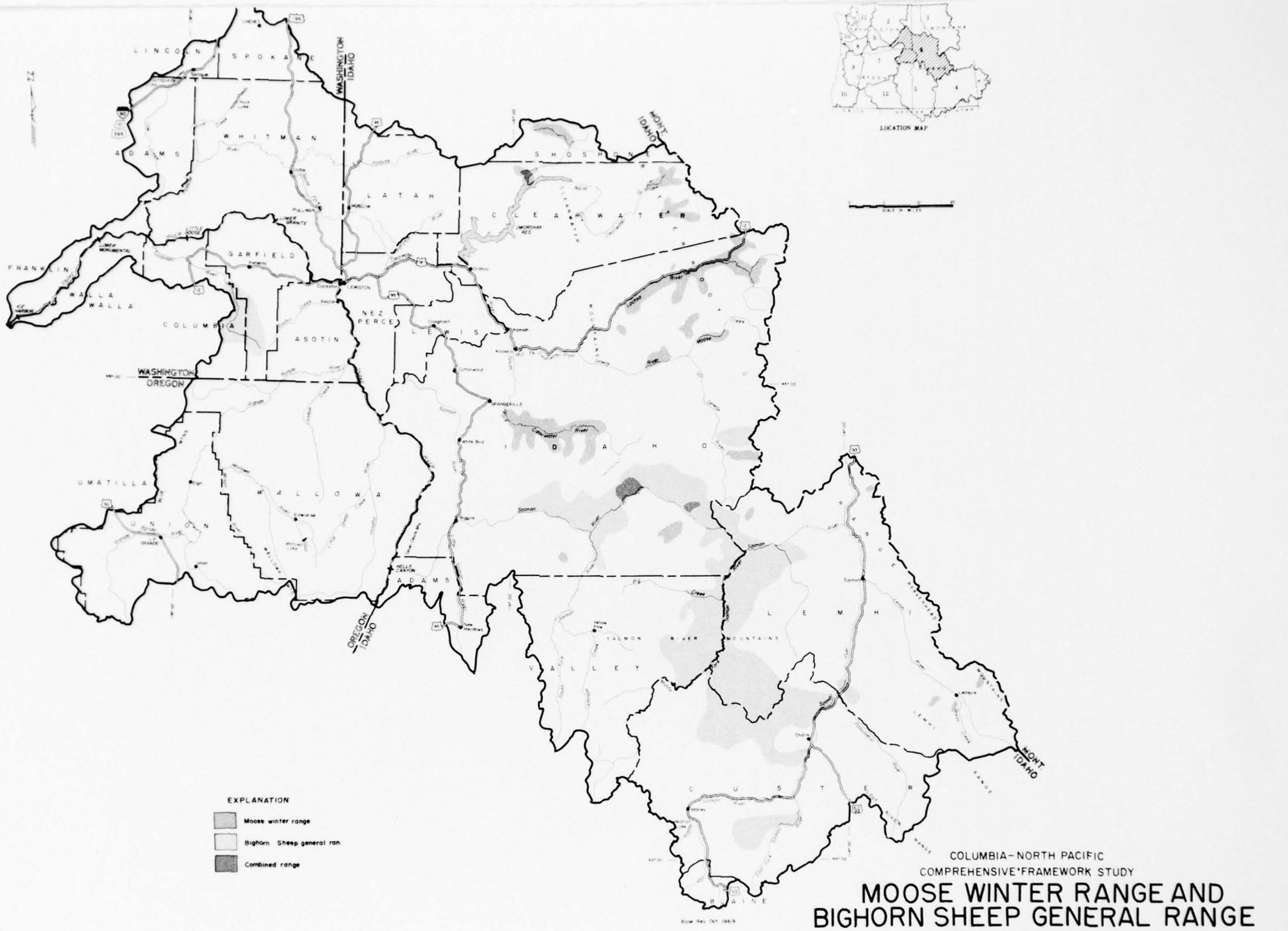
COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

PRONGHORN ANTELOPE AND WHITE-TAILED DEER RANGES

LOWER SNAKE SUBREGION 6

1970

FIGURE 27



COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

MOOSE WINTER RANGE AND BIGHORN SHEEP GENERAL RANGE

LOWER SNAKE SUBREGION 6

1970

FIGURE 28

Elk Large elk herds inhabit the vast timbered areas of the Lower Snake Subregion which provide wide variety in elk habitat. Extensive fires in the past removed coniferous timber from large areas, and elk thrived and increased greatly in the brush fields which sprang up in the years following the fires. In some drainages at higher elevations elk replaced mule deer as the most common big game animal in the past 35 years or so. In many areas elk populations in recent years have reached or exceeded the capacity of the brush fields to supply forage. In some old burns the dominant conifer timber has already replaced or reduced the brush. In such areas elk are now less abundant than a few years ago. Elk have recently extended their range in portions of the lower Clearwater River drainage to include lowland areas on and adjacent to the cultivated agricultural lands.

Mule Deer Mule deer are found throughout the Lower Snake Subregion, including the cultivated valleys and some dry farming lands. They are especially abundant in the Hells Canyon country and in the rough breaks of the Snake River in a large tri-state area surrounding the junctions of the Grand Ronde, Imnaha and Salmon Rivers with the Snake River. They are also abundant in the upper reaches of the Salmon River drainage, particularly in the watersheds of the Lemhi, Pahsimeroi, Middle Fork Salmon and East Fork Salmon Rivers. Large concentrations of mule deer often occur in the valley bottoms and on the exposed south slopes of the adjacent ridges in winter. Bitterbrush and mountain mahogany are important browse species in much of the better mule deer range, with the sagebrush-grass zone also important in some arid southeastern ranges.

White-tailed Deer Whitetails occur mainly in the northern part of this subregion, especially in the drainages of the Clearwater and Palouse River systems. They are found mostly at lower elevations, particularly where cutover lands are intermixed with farmlands and brushy bottomlands.

Moose Moose are found mainly in the northeastern part of the subregion. They inhabit local areas which are widely distributed, principally in the brush and timber along stream courses and lake shores in the more isolated portions of the watersheds of the North Fork Clearwater, Lochsa, Selway, and South Fork Clearwater Rivers.

Pronghorn Antelope Preferred habitat of antelope here includes mainly the open semi-arid valleys and sagebrush-grass ranges in the southern and eastern parts of Custer and Lemhi counties in Idaho. Antelope range in such situations overlaps mule deer range.

Bighorn Sheep Bighorn sheep inhabit the more remote and precipitous mountain terrain. They are thriving only in areas which

are not used by domestic livestock. Some of the herds winter in areas adjacent to towns and ranches. Practically all of the known herds of Rocky Mountain bighorn sheep in Idaho are within the Salmon River drainage, but one small group lives in the vicinity of Indian Creek in the upper Selway River drainage. A herd of about 50 bighorn, established by introduction of trapped animals, occupies mountain range in Garfield County, Washington.

Mountain Goat Mountain goat mainly inhabit the country surrounding the junction of the Middle Fork Salmon and the Salmon Rivers and the higher mountain ranges at the headwater tributaries of the Clearwater and Salmon Rivers. Smaller numbers occur at other places. Wild-trapped goat have been released in three areas in the past two decades: Wallowa Mountains in northeastern Oregon, Seven Devils Mountains in western Idaho, and Johns Creek drainage in the South Fork Clearwater area in Idaho.

Black Bear Black bear occur throughout the subregion. They are most plentiful in the brush and timber areas of the more remote mountain ranges and are relatively scarce in the valleys and agricultural areas where there is more human activity.

Grizzly Bear If grizzly bear still occur here they are very scarce. Reports persist of their occurrence in the more isolated and rugged mountains.

Mountain Lion Mountain lions require rugged terrain, in which they can live with relatively little human disturbance. Highest lion populations occur in areas where elk or deer, or both, are plentiful. Habitat for mountain lion is extensive where human access is difficult and the large populations of elk and deer provide the main source of winter food. The mountain lion is protected as a game animal in Oregon and Washington. In Idaho it is still classed as a predator.

Use

Estimated hunting use of big game in 1965 totaled 830,000 man-days. The distribution of this use by species and State is shown in table 48.

Because of the rugged terrain, the extent of wilderness and primitive areas, the variety of big game species, and the total population, it is likely that the overall values related to big game are greater here than in any other subregion. These include judgment and esthetic values in addition to those ordinarily measured in economic terms. The exceptional opportunity to hunt, observe, photograph, or study a great variety of big game species in large numbers in a wilderness setting makes the area nationally important.

Big game hunting has much to offer the sportsman. (Idaho Fish and Game Department)

Table 48 - Estimated Hunting Use of Big Game, Subregion 6, 1965[1/]

	Hunter-Days			
Species	Idaho	Oregon	Washington	Totals
Mule Deer	164,220	69,604	80,340	314,164
White-tailed Deer[2/]	--	--	--	--
Elk	237,299	193,874	70,067	501,240
Pronghorn Antelope	1,461	--	--	1,461
Moose	245	--	--	245
Mountain Goat	1,690	25	--	1,715
Bighorn Sheep	2,005	--	--	2,005
Black Bear	5,000	3,500	428	8,928
Mountain Lion	500	--	--	500
Totals	412,420	267,003	150,835	830,258

1/ Data supplied by Idaho Fish and Game Department, Oregon State Game Commission, and Washington Department of Game.

2/ About 25 percent of use shown for Idaho mule deer hunting was for white-tailed deer. About 10 percent of Washington mule deer hunting use was for whitetails. Oregon figures include very few whitetails.

Hunters spent over $10 million for big game hunting in 1965. Informed judgment values in addition to those shown by expenditures would place the resource value much higher.

The capacity for increased use of big game lies mainly in mule deer and elk hunting. Deer and elk in parts of the Lower Snake Subregion receive relatively light hunting pressure because they are remote from the centers of human populations.

Factors Affecting Resource

Land use vitally affects big game. Amount of big game in the Lower Snake Subregion depends largely upon trends in timber management, road construction, livestock grazing, and regulations concerning land, water, and wildlife. If properly planned, all of these activities aid big game. By the same token, such activities are very detrimental to big game without coordinated and considerate planning.

Man's activities and natural plant succession have caused changes in the big game resource in the century since early settlement by white men. Especially important have been the cutting of timber, grazing of livestock, growth of brush fields following the early day fires and, more recently, regrowth of timber to replace the brush fields.

The relatively low number of deer and elk hunters in remote areas results in moderate harvest. This permits big game populations to maintain themselves at capacity numbers without reaching their potential for net annual increase.

Detrimental Factors The year round grazing by livestock which has removed forage needed by bighorn sheep on winter ranges is of special significance here. This is a critical problem at several places in the upper Salmon River drainage.

The succession of large brush fields to timber is now limiting the elk herds in large areas. Human disturbance is also detrimental to wintering elk at various places.

Construction of Dworshak Dam has destroyed deer and elk winter range. The subsequent impoundment behind this dam will destroy forage and thereby reduce the winter carrying capacity of the North Fork Clearwater River area for elk.

The construction of the highway along the Locksa River has seriously reduced the winter range available to deer and elk in this major big game area. Highway traffic in this area causes disturbances which are further detrimental to the game animals.

Water development creates serious big game habitat losses. (Idaho Fish and Game Department)

Sagebrush eradication projects in southeastern ranges are affecting forage used by antelope. Whether the net effect will be harmful or beneficial to antelope is not yet clear.

Beneficial Developments and Programs Hunting seasons established on a factual basis have greatly increased public hunting opportunity in recent years.

Many of the recent improvements in management are based upon results of research which have become available only recently. This includes such measures as use of prescribed or controlled burning to improve elk habitat and management rather than indiscriminate control of predators. For example, research in the Salmon River drainage has shown that mountain lion are an important factor in maintaining stability in wilderness environments where man does not take an adequate harvest of big game animals.

Clear-cut logging has improved browse for big game, particularly in parts of the subregion where annual precipitation is high. Similar improvements sometimes have resulted from clearings associated with power transmission lines.

Special developments to benefit big game include management of about 15,700 acres in the Tucannon and Asotin Wildlife-Recreation Areas in Washington, and the retirement of livestock grazing on about 2,000 acres in several separate reaches in the Idaho back country.

Cooperative range research and big game range development programs involving State and Federal agencies have been productive. These include the joint inspection of areas and planning of programs which will protect and improve the production of timber and range forage while retaining wildlife habitat. Acquainting the public with the need for range protection and development, habitat management and related programs has been helpful to the progress of such work.

Upland Game

Upland game species in Subregion 6 are ring-necked pheasant, chukar, Hungarian partridge, valley quail, mountain quail, bobwhite, Gambel's quail, blue grouse, ruffed grouse, spruce grouse, sage grouse, sharp-tailed grouse, wild turkey, mourning dove, cottontail, and pigmy rabbit.

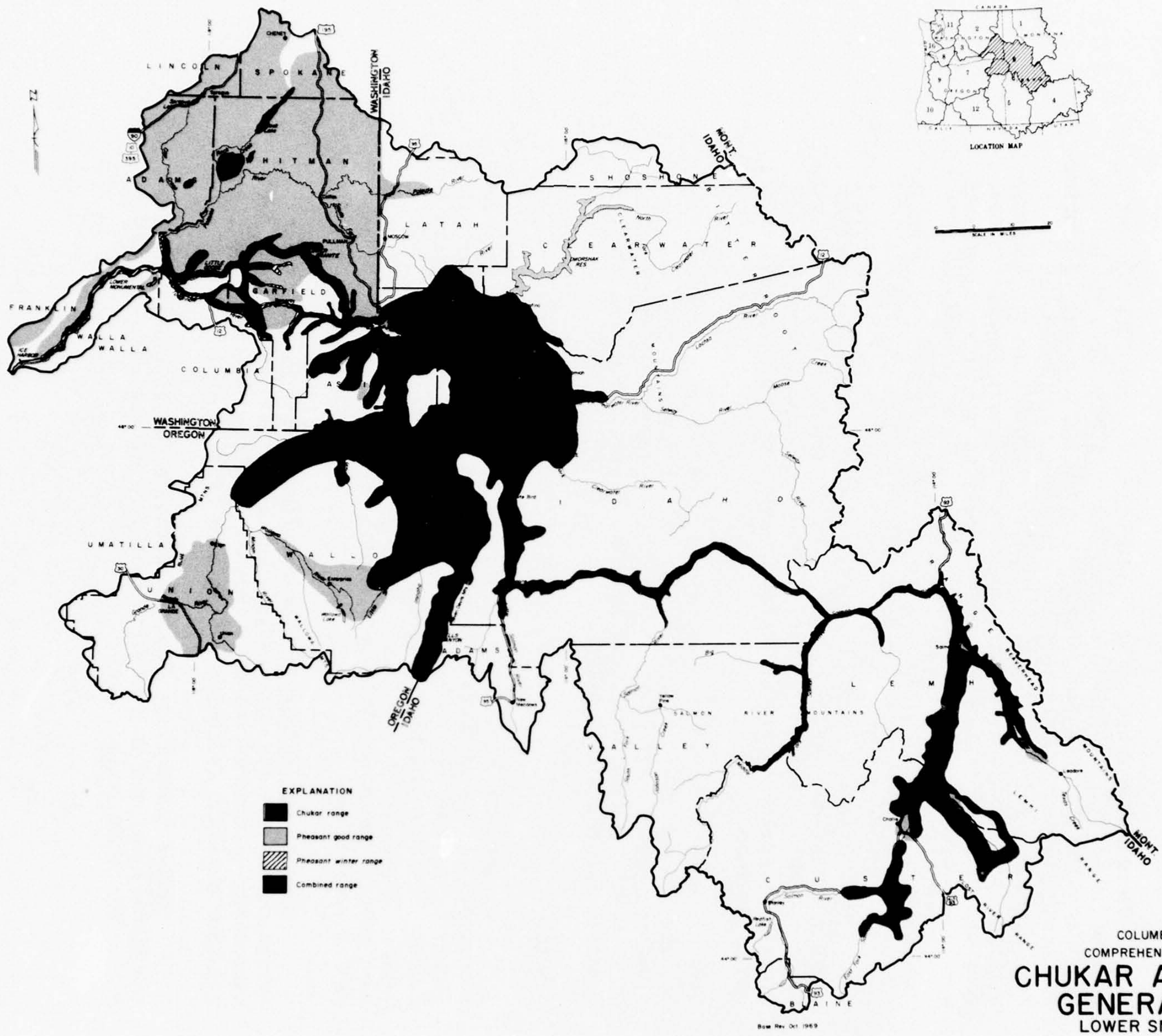
Figure 29 shows the general range of the ring-necked pheasant and the general range of the chukar. Areas shown on this map include practically all of the areas which provide hunting for these birds. Maps for the other upland game species are not shown since detailed information is lacking.

Habitat

Upland game habitat is varied, including semi-arid sagebrush rangelands in the southeast, high mountains and dense coniferous forest in much of the subregion, cultivated farmlands mainly in the Palouse country, and brushy foothills which connect these large areas. The varied habitat is reflected in the great variety of upland species which occurs here. Habitat for each species is described separately.

Ring-necked Pheasant The farmlands here are mainly non-irrigated and provide only marginal pheasant habitat. The predominant wheat farming leaves a minimum of nesting or winter cover, and food for pheasant is scarce during much of the year.

Chukar Excellent chukar habitat is found principally along the Snake River and in some of the canyons of the lower and upper Salmon River drainage.



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

CHUKAR AND PHEASANT GENERAL RANGES

LOWER SNAKE SUBREGION 6

1970

FIGURE 29

Pheasant habitat within the subregion is in short supply. (Idaho Fish and Game Department)

Hungarian Partridge The grassy foothills and the cultivated lands provide excellent habitat for this species. In some local areas where grassland meets rougher land, Hungarian partridge and chukar occur in close proximity.

Valley Quail This species is found mainly in the bottomlands along the Snake River and its lower tributaries. It also ranges up into the foothills along the creeks.

Mountain Quail This species prefers brushy habitat along the small tributary creeks which descend from the higher timbered country in the western part of the subregion. However, some mountain quail occur in bottomlands along the larger watercourses where their range somewhat overlaps that of valley quail. Their distribution is rather spotty, but they are found mainly in the lower parts of the Snake, Salmon, and Clearwater drainages.

Bobwhite The bottomlands along the Snake and Clearwater Rivers and their lower tributaries provide an interspersion of cropland, pasture, and brush cover which makes excellent bobwhite habitat.

Gambel's Quail In the entire Snake River watershed this species of quail occurs only in a limited portion of the Lemhi River Valley where it was introduced nearly 50 years ago. Brushy cover along small streams is used by these quail at an elevation of about 4,000 feet.

Blue Grouse Blue grouse are relatively abundant in some areas, but scattered populations occur throughout the forested country. They thrive best in mountainous habitat where the lower, well-grassed slopes provide nesting and brood rearing cover and the upper slopes provide coniferous cover used in the fall and winter.

Ruffed Grouse The timbered edges and the lower shrub-bordered drainages provide habitat in which ruffed grouse are rather abundant. The forest type preferred by ruffed grouse is generally a well-watered but fairly open mixture of deciduous trees, conifers, and berry-yielding shrubs. Alder and aspen thickets are frequently used by these birds.

Spruce Grouse This species occurs mainly in the higher timbered country. Its range sometimes overlaps with blue grouse in elevational range but it does not exhibit the distinct elevational movement from spring to fall which is characteristic of blue grouse.

Sage Grouse Most of the sagebrush range is occupied by sage grouse. However, these birds are more numerous in the southeastern parts of the Salmon River drainage than elsewhere in the subregion. Meadow and seep areas in which forbs and other green vegetation are abundant are used by sage grouse, particularly in summer and early fall.

Sharp-tailed Grouse Only a few sharp-tailed grouse are found here. They occupy grasslands in the northwestern part of the subregion.

Wild Turkey Wild turkey habitat is rather limited, including mainly the edges of the coniferous timber belt where suitable roost trees and a variety of natural foods occurs. Turkeys are found only in or adjacent to areas where recent introductions have been made, mainly in northeastern Oregon and western Idaho.

Mourning Dove Orchards, farm trees, and scattered timber at lower elevations supply nesting habitat for mourning dove. Food is abundant in the croplands and some doves spend the winter in the protected valleys near Lewiston where winters are mild.

Cottontail and Pigmy Rabbit The river bottoms of the main stream drainages provide optimum habitat for the cottontail which occurs in reasonably good numbers throughout the agricultural

areas. The pigmy rabbit is largely limited to the sagebrush flats and foothills of the upper Salmon River watershed.

Use

The annual use of upland game by hunters is about 394,000 man-days. Table 49 shows use for the various species.

Table 49 - Estimated Annual Hunting Use of Upland Game, Subregion 6

Species	Hunter-Days			
	Idaho1/	Oregon2/	Washington3/	Totals
Ring-necked Pheasant	28,800	8,700	147,700	185,200
Chukar	8,500	4,800	46,500	59,800
Hungarian Partridge	8,400	2,500	17,000	27,900
Valley Quail	5,700	1,300 4/	53,000 4/	61,900 4/
Mountain Quail	1,700	--	--	--
Bobwhite	100	--	--	--
Gambel's Quail	100	--	--	--
Ruffed Grouse	10,600	--	--	--
Blue Grouse	10,600	3,600 5/	11,700 5/	38,800 5/
Spruce Grouse	2,300	--	--	--
Sage Grouse	600	--	100	700
Mourning Dove	4,800	300	7,300	12,400
Cottontail and Pigmy Rabbit	1,300	2,500	3,100	6,900
Totals	83,500	23,700	286,400	393,600

1/ Idaho Fish and Game Department data, 1965.
2/ Oregon State Game Commission data, 1966.
3/ Washington Department of Game pheasant and forest grouse data for 1965; other species 1966.
4/ All quail species.
5/ All forest grouse species.

While there is considerable variety in upland game, this area is especially attractive for chukar hunting and wilderness-type hunting for several species of grouse. The relatively low hunting pressure on most species results in high quality recreation. Hunters spent about $1,887,000 for upland game hunting in 1965. Annual expenditures do not show the total resource value.

There is considerable capacity for increased use of several upland game species, particularly chukar, valley quail, ruffed grouse, blue grouse, and spruce grouse. Pheasant hunting makes up nearly 60 percent of the current hunter use of upland game and it is certain to remain important in the future. However, the part of the capacity for increased use of upland game represented by other species combined could nearly equal pheasant hunting in recreation potential. Remoteness and difficult access will doubtless keep use of some segments of this potential at a low level.

Factors Affecting Resource

Many of the detrimental factors, as well as the beneficial developments, affecting upland game are directly related to land use.

Detrimental Factors Agricultural land use is the major factor determining pheasant welfare. Clean farming throughout the main belt of non-irrigated farmland has caused much reduction of pheasant habitat in recent years.

Ruffed grouse are limited by the distribution of their preferred habitat. Some formerly productive grouse habitat has recently been lost as the fingers of brushy cover along small streams were eliminated to convert more land to cultivation. Blue grouse have been adversely affected by heavy grazing on their lower nesting and brooding ranges.

Sage grouse are almost completely dependent on sagebrush for food and cover. Sage grouse, already much reduced by elimination of sagebrush for croplands, are now experiencing further reduction of habitat through extensive sagebrush eradication programs. Such programs, using chemical and mechanical methods on private, State, and Federal lands, have been proceeding rapidly since 1950.

Most of the prairie grassland is now gone from the subregion. Plowing the grassland has effectively reduced sharp-tailed grouse populations through destruction of their habitat.

The cottontail is limited by the extent of area which provides good food and cover. Agricultural practices have removed brush cover used for nesting and escape sites.

Some practices commonly considered to be beneficial to agricultural operations have brought about rather extensive losses to upland game habitat. For example, in Whitman County, Washington, wildlife habitat has suffered losses through several Agricultural Conservation Program practices costing about $1,255,500 which included underground drainage of 13,615 acres, noxious weed control

on 208,486 acres, land clearing on 624 acres, and channel clearance affecting 48,764 feet of riparian cover.

Beneficial Developments Most of the developments favoring upland game are benefits related either to irrigation and resultant land use changes or to timber management practices, especially harvest operations. Some land management programs have included development of wildlife habitat as a part of the overall plan, both on private and public land. Several newly irrigated tracts have been opened in recent years. These tracts have provided additional pheasant habitat which appears to balance somewhat the loss of habitat quality which usually accompanies further development of long established irrigated tracts.

In Washington, upland bird habitat developments are maintained by agreement with 50 farmers. These comprise 85 habitat areas with woody plantings, seedings, and about 5 miles of fencing. Also included are 46 upland bird cisterns and 8 spring developments, all maintained on private lands.

Some land management agencies are adjusting their range management programs to maintain important habitat for wildlife. The State wildlife agencies in Idaho and Oregon have entered into cooperative agreements with the Bureau of Land Management and the U.S.D.A. Forest Service to provide for joint review of all proposed brush eradication projects with a view to preserving food and cover important to sage grouse and other wildlife. Key sage areas are often preserved during sage-to-grass conversion projects to protect the sage grouse habitat. Under certain circumstances, range improvement programs have been known to improve sage grouse habitat. A program of cistern installation to benefit forest grouse has been undertaken in the Blue Mountains of Washington.

Doves benefit from agricultural operations which provide additional nesting, feeding, and watering situations.

Fur Animals

The fur animals here include badger, beaver, bobcat, coyote, lynx, marten, fisher, mink, muskrat, otter, raccoon, red fox, spotted skunk, striped skunk, weasel, wolverine, and possibly nutria. State laws regarding classification of fur animals are not uniform, but the list above includes species which may be expected to reach the fur markets. In addition, some pelts from white-tailed jack rabbit, snowshoe rabbit, and mountain lion may reach the market.

Habitat

Species and numbers of fur animals vary according to the habitat. Beaver, muskrat, and mink are found along most streams, lakes, and ponds. Muskrat are abundant mainly in the Lemhi, Pahsimeroi, and Grande Ronde drainages while beaver and mink occur mainly in the higher timbered areas on the tributaries in the upper Salmon River drainage. Widely distributed fur animals which live away from water are the badger, bobcat, coyote, spotted skunk, striped skunk, and weasel. Otter occur in many of the mountain streams, especially in the Clearwater River drainages, but also in the Wallowa Mountains and in the Salmon River drainage. Nutria, if still present, exist only in limited areas at lower elevations. Red fox are found mainly in the valleys of the extreme southeastern part of the subregion. Marten are limited to the higher mountains, while lynx occur mainly in remote Idaho areas. Raccoon are common along streams, especially in the lowlands. Wolverine are scarce but are seen occasionally in timbered areas in Idaho. Fisher are seen infrequently in remote areas of the Clearwater and Salmon River drainages where the present population probably includes mainly descendants of wild-trapped fisher from Canada which were released in 1962 and 1963.

Use

A steady decline of trapping activity since about 1950 has come about because of changes in economic conditions, including the modern way of life as well as depressed prices for furs. Recently trapping has been mainly for muskrat, beaver, mink, bobcat, and raccoon. The furbearers as a group could produce considerably more fur than has been marketed annually in recent years.

Idaho fur yields in this subregion in the 1965-66 season totaled about 7,200 pelts which included over 5,000 muskrat, nearly 500 beaver, nearly 500 mink, and smaller numbers of at least nine other species, mainly bobcat, red fox, marten, coyote, raccoon, and otter. While Idaho trappers sold pelts from nearly 300 bobcat and over 100 coyote, the unknown numbers of these two species taken in Idaho by other methods were undoubtedly much larger. In the 1965-66 trapping season the Oregon portion of the subregion yielded approximately 5,000 beaver, 100 mink, 100 raccoon, and less than 100 pelts of any other single species. In addition, about 300 bobcat and nearly 400 coyote were taken by hunting and other methods. Washington trappers took over 3,000 pelts, mainly muskrat, beaver, and mink in the 1965-66 season in this area. As in Idaho and Oregon, hunting for bobcat and coyote provides considerable winter recreation in some localities in Washington.

Based upon trappers' reports, the market value for furs taken during the 1965-66 trapping season was approximately $53,000.

Trapping pressure was formerly attracted mainly by beaver, mink, and muskrat, but in the 1965-66 season the total value of bobcat pelts taken by trappers was nearly as great as that for mink.

The furbearers have wide esthetic appeal, aside from their commercial value, and their presence affords great opportunity for educational and scientific purposes in demonstrating ecological principles to the public. The pleasure which people derive by observing wild animals in their natural surroundings probably represents the greatest importance of the fur animals and other nongame animals. As in other areas, campers and fishermen here sometimes have the thrill of watching otter, mink, or beaver. In addition, the area offers the rare possibility of seeing fisher, wolverine, or lynx.

The human benefits to be gained from such outdoor pleasure provide one of the most important reasons why land and water use plans should provide for the maintenance of a diverse and productive natural habitat. Destruction of habitat or elimination of an animal species represents greater loss than economic value alone.

Factors Affecting Resource

Altering stream channels, removing streamside cover, brush and trees, and overgrazing by domestic livestock have combined to reduce the total habitat available to furbearers. Clean farming practices on agricultural lands have also reduced such habitat. Pest control programs and improperly planned use of rodenticides and insecticides undoubtedly have been detrimental to furbearers in some instances, but the effects of such operations have usually not been understood nor carefully evaluated. Domestic, agricultural, and industrial pollution of streams have reduced furbearer populations in some local areas.

Waterfowl

At least 15 species of ducks occur here during the year, including mallard, baldpate, green-winged teal, cinnamon teal, pintail, American goldeneye, gadwall, shoveler, canvasback, lesser scaup, ruddy, ring-necked duck, bufflehead, wood duck, and blue-winged teal. The more common species nest here, but some of these species are here only during seasonal migrations. The Great Basin Canada goose nests in the lower drainages, and snow geese migrate through the area.

Habitat

Figure 30 outlines the important production and wintering habitat for waterfowl. There are no major duck or goose production

areas here, but mountain meadows and meadowlands bordering streams produce ducks in moderate numbers.

Moderate numbers of Canada geese, and some ducks, winter in the lower Clearwater drainage. Moderate numbers of ducks, mostly mallard and baldpate, winter in the Pahsimeroi drainage.

Use

Hunter use of waterfowl in 1966 was estimated at 75,000 hunter-days. An analysis of this use is shown in table 50.

Table 50 - Estimated Annual Hunting Use of Waterfowl, Subregion 6[1/]

	Hunter-Days			
Waterfowl Group	Idaho	Oregon	Washington	Totals
Ducks	5,300	9,184	--	--
Geese	4,334	2,266	--	--
Coot	524	--	--	--
Totals	10,158	11,450	53,734	75,342

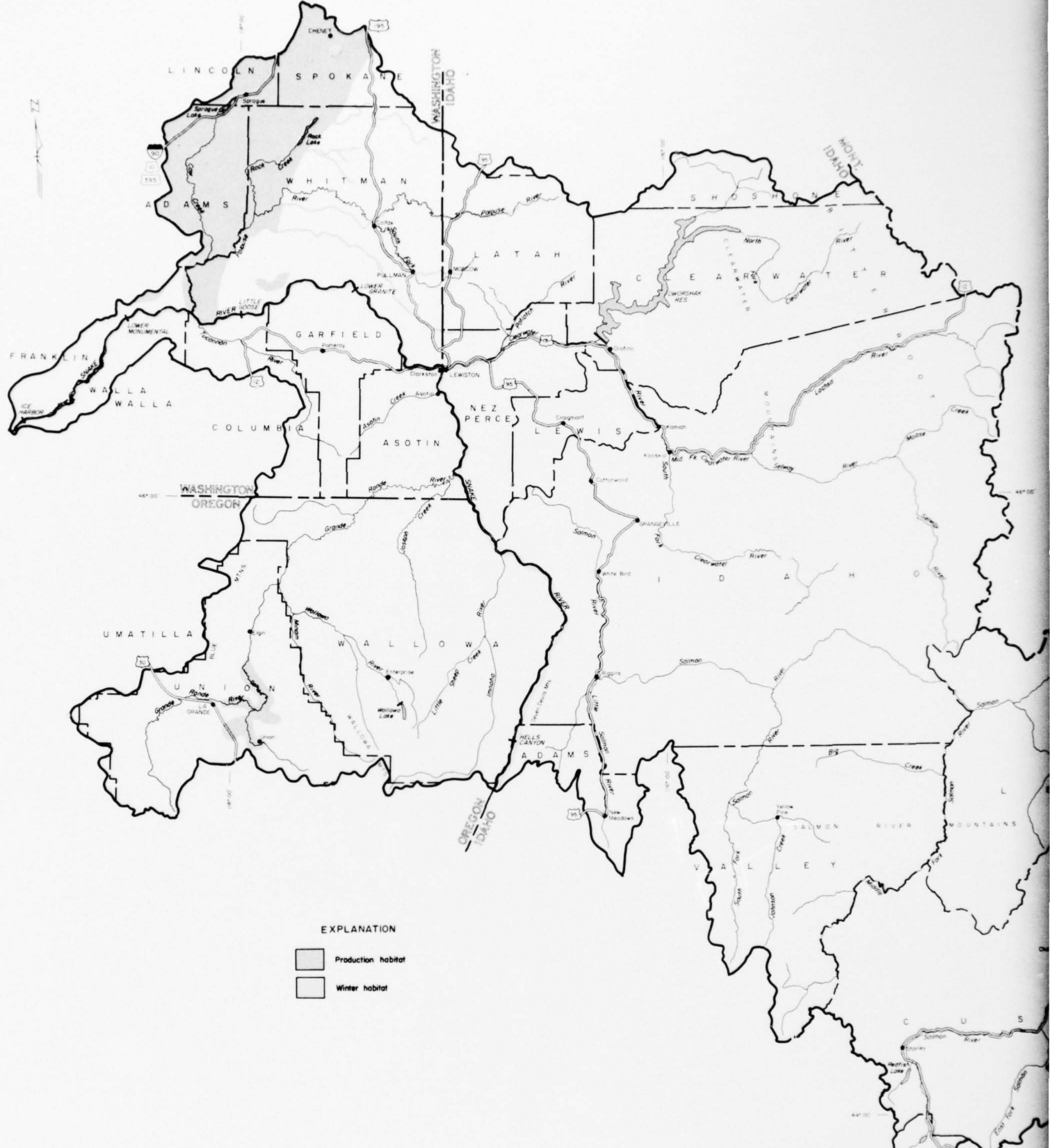
1/ Based on 1966 data from Idaho Fish and Game Department, Oregon State Game Commission, and Washington Department of Game.

Waterfowl are managed on a flyway basis which involves interstate and international cooperation. There may be some waterfowl species for which additional harvest is desirable. However, any estimate of capacity for increased use locally would probably be dependent upon use or projected use in other parts of the flyway. Hence, no estimate of the capacity for increased use will be made in this appendix.

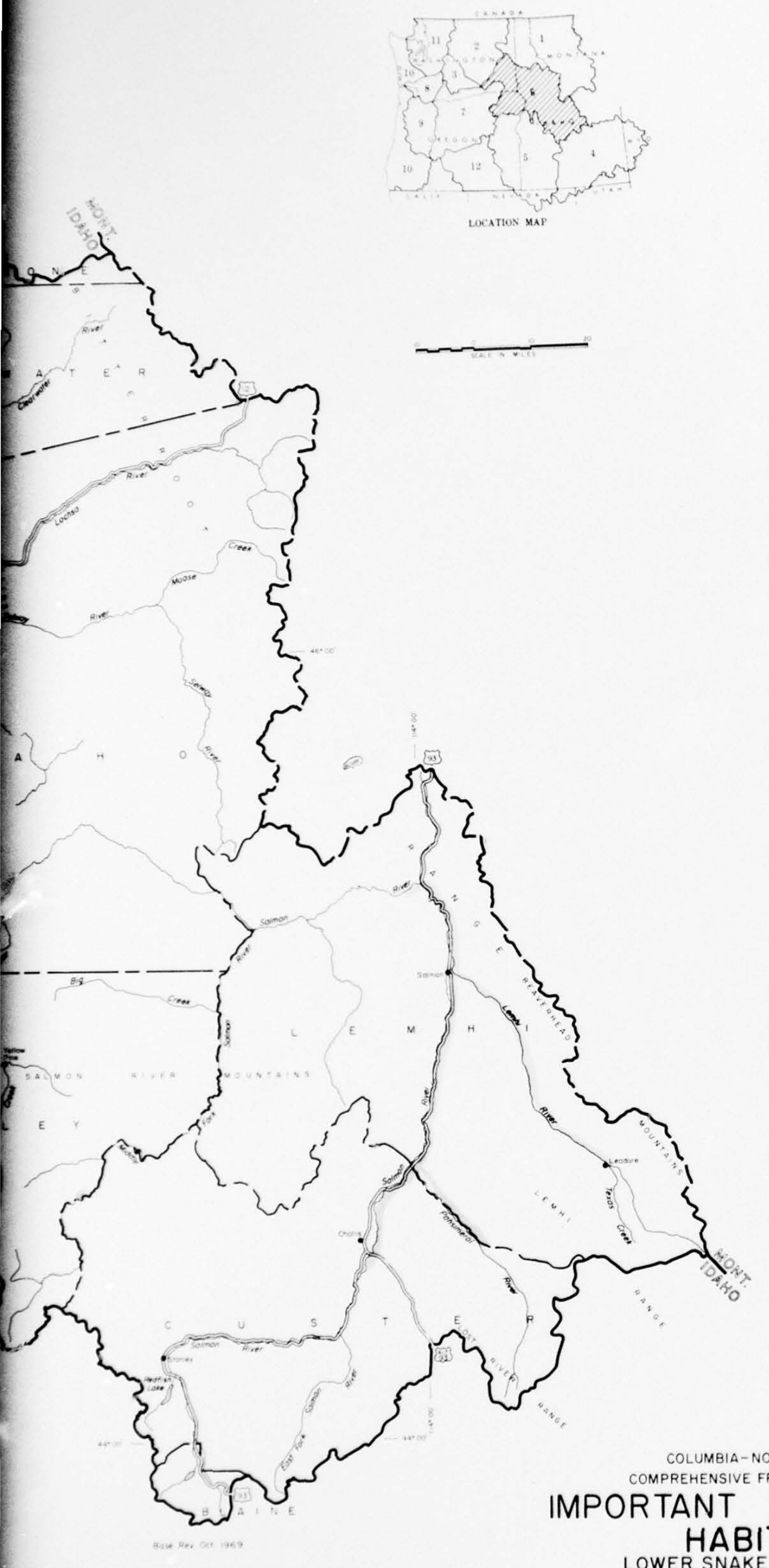
Hunters spent about $708,000 for waterfowl hunting in 1965. Winter-time hunting, mainly for mallard, provides quality sport in the northwest part of this subregion. Annual expenditures do not show the true or complete resource value, but are one indication of the importance of the resource.

Factors Affecting Resource

Flooding or drainage of meadowlands seriously reduces nesting habitat for waterfowl. Grazing and farming of stream borders commonly causes reduction or destruction of nesting habitat in this subregion.



EXPLANATION
Production habitat
Winter habitat
LINCOLN
SPOKANE
ADAMS
WHITMAN
FRANKLIN
WALLA WALLA
COLUMBIA
GARFIELD
ASOTIN
LATAH
NEZ PERCE
LEWIS
CLEARWATER
SHOSHONE
IDAHO
UMATILLA
UNION
WALLOWA
ADAMS
VALLEY
CUSTER
BLAINE
WASHINGTON
IDAHO
WASHINGTON
OREGON
OREGON
IDAHO
MONT.
IDAHO
Cheney
Sprague
Sprague Lake
Rock Lake
Rock Creek
Palouse
Pullman
Moscow
Colfax
Lower Granite
Little Goose
Lower Monumental
Ice Harbor
Snake
Tucannon River
Pomeroy
Clarkston
Lewiston
Asotin
Asotin Creek
Grande Ronde River
Potlatch
Clearwater
Orofino
Dworshak Res
North Fork Clearwater
Lochsa River
Selway River
Kamiah
Kooskia
Grangeville
Cottonwood
Craigmont
White Bird
Salmon River
Riggins
Little Salmon River
New Meadows
Hells Canyon
Imnaha
Wallowa River
Enterprise
Wallowa Lake
La Grande
Elgin
Union
Minam
Stanley
Redfish Lake
East Fork Salmon
Salmon River Mountains
Big Creek
Johnson Creek
South Fork Salmon
Middle Fork
Yellow Pine
46°00'
44°00'
Base Rev. Oct. 1969



COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

IMPORTANT WATERFOWL HABITAT

LOWER SNAKE SUBREGION 6

1970

FIGURE 30

Excessive siltation of some bottomlands in the Palouse River drainage has been detrimental to waterfowl production habitat.

The subregion contains one Federal waterfowl refuge and one State refuge in Washington.

Fencing and revegetating streambanks are measures which have been used in some instances with benefit to waterfowl habitat.

Farm ponds, fish ponds, and irrigation storage reservoirs, on private lands, provide some useful waterfowl nesting habitat but this has not been evaluated. The value of these water areas for waterfowl nesting is largely dependent upon management of the shoreline and nearby cover.

Other Wildlife

Many other kinds of wildlife are found in the Lower Snake Subregion. Bald eagles commonly winter near the larger streams and reservoirs. Golden eagles are common, especially in the southeast where broad valleys are paralleled by mountain ranges. Other birds which are characteristic of this area are the American merganser, western meadowlark, water ouzel, common crow, and several species of hawks and owls. Resident species whose population status is still undetermined nationally are the ferruginous hawk, American osprey, and prairie falcon. The American osprey nests here in isolated areas, particularly in the North Fork Clearwater drainage, but also along other streams. Sandhill cranes occur in limited areas.

There is special interest in mountain lion which occur mainly in the mountainous areas. Research in the Idaho Primitive Area should lead to more purposeful management of this species in the future. Despite lack of legal protection in areas where the habitat provides security these animals maintain stable populations which apparently are limited by behavior patterns, including individual adult lions' respect for the territories of other lions.

Many other wildlife species are important to humans in one way or another. These include various rodents and birds, all of which have definite but often undocumented requirements. The variety of wildlife, both game and nongame, is one of the outstanding attributes of this area.

Habitat

Each kind of habitat is used by one or more wildlife species, but little is known about some of the less extensive types of habitat which support some of the less common species of wildlife. The

relatively undisturbed mountainous and timbered lands in this area provide wildlife habitat which is of limited occurrence elsewhere.

Use

Hunting use data on nongame species generally are not available, but in the Washington portion of the subregion in 1965 it was estimated that 28,000 hunter-days were spent in pursuit of marmot, ground squirrel, jack rabbit, various "varmints," and predatory birds and mammals. Such use in the entire subregion is estimated to be less than 10 percent as great as hunting for game species. A use which affects increasing numbers of people is in the enjoyment of wildlife through observation and exploration. Scientific research also looks toward wildlife as the source of basic and otherwise important biological information.

The Lower Snake Subregion is of special importance to wildlife because of the combination of rugged terrain and great mountain streams. The wildlife here are of special importance to people who desire a naturalness uncluttered by the usual accompaniments of urban life.

The enrichment of experience which is provided by man's interest in and association with wildlife is an unquestioned value.

Factors Affecting Resource

Highway construction and water development, particularly dam building, have reduced the habitat for various kinds of wildlife. Ill-advised or excessive use of pesticides and herbicides frequently causeswildlife losses either directly or through destruction of habitat. Predator and rodent control activities have often taken animals beyond what could be justified in terms of total public interest.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

In this outstanding outdoor area, the provision of opportunities for fishing and hunting will require extensive programs integrated with the other uses of land and water.

Coordinated resource planning is essential to perpetuate fish and wildlife of Lower Snake Subregion. (Idaho Fish and Game Department)

Fishing

Protection and enhancement of stream fisheries offer the best means of satisfying future fishing needs. Streams should be protected against channelization for flood control, irrigation, logging, mining, and road building. Minimum flows should be established for all streams. Many stream sections could be greatly enhanced with a guaranteed minimum flow year round.

Grayling have been introduced in alpine lakes of the Selway River drainage. Should they prove to be successful, additional waters will be stocked with these fish.

As fishing pressure continues to increase, effort should be accelerated to purchase or lease areas to provide access to fishing waters. Over 24 percent of the Idaho stream mileage in the subregion is bordered all or partly by private lands. Public access needs are proportionately greater near population centers. While 76 percent of the stream mileage lies within Federal lands and is accessible to the fishing public, much of it is small, low producing, mountain streams. Larger, more productive streams in the lower part of the subregion are often associated with agricultural development and private lands.

Habitat Preservation

Maintaining quality fishing will require that stream habitat be preserved. Certain streams should be retained in their present state.

Consistent with the preservation objective, the following rivers have been designated as part of the National Wild and Scenic River System:

Clearwater River, Middle Fork - from town of Kooskia upstream to town of Lowell
Lochsa River - from its junction with Selway River at Lowell, upstream to Powell Ranger Station
Selway River - from Lowell upstream to its origin
Salmon River, Middle Fork - all

The following river has been recognized as a study river under P.L. 90-542 (Wild and Scenic Rivers Act):

Salmon River - segment from town of North Fork to its confluence with Snake River

In the interest of anadromous and resident fish, the following streams should be preserved in their present state and possibly enhanced:

Salmon River streams excluding Federally designated and proposed wild rivers:

- Little Salmon River - all
- Rapid River - all
- South Fork - all, including East Fork of South Fork and Johnson Creek
- Panther Creek - all
- North Fork - all
- Salmon River - from town of North Fork upstream to origin
  - Lemhi River - all
- Pahsimeroi River - all
- East Fork Salmon River - all
- Yankee Fork - all
- Valley Creek - all

Clearwater River streams except Federally designated portions and Dworshak pool:

Clearwater River - from Lewiston to Kooskia
North Fork - all
Little North Fork - all
Kelly Creek - all
Meadow Creek - all
Lochsa River - from Powell Ranger Station upstream to Selway-Bitterroot Wilderness boundary
South Fork - all
American River - all
Red River - all

Snake River - from Lewiston to Hells Canyon Dam and following west side tributaries:

Grande Ronde River - all
Minam River - from Eagle Cap Wilderness boundary to mouth
Wenaha River - from forks to mouth
Wallowa River - from Wallowa Lake to mouth
Imnaha River - from Eagle Cap Wilderness boundary to mouth

White sturgeon habitat in the Snake and Lower Salmon Rivers should be preserved to save this endangered species.

Table 51 lists water requirements for providing minimum flows for fish and wildlife at selected points.

To protect stream environments, an adequate vegetative buffer should be provided along streams to protect them from siltation resulting from logging operations. An effective permit system for building roads in back country and across other wild lands should be established to ensure adequate means for inclusion of recommendations involving fish and wildlife resources.

Habitat Improvement

Habitat improvement for resident fish should be achieved by removing barriers to fish passage (such as Lewiston Dam when the Federal Power Commission license expires in 1974), treating wastes from industrial, domestic, and mining pollution, controlling erosion, optimizing streamflows, laddering dams, providing for temperature control in water released from reservoirs, making structural improvements in streambeds, and constructing fishing lakes where they would not harm fish and wildlife resources.

Table 51 - Minimum Flows for Fish and Wildlife at Selected Points,1/ Subregion 6

Stream	Point	Minimum Flow (cfs)
Snake River	Hells Canyon Dam	7,000
Salmon River	Whitebird	2,500
Little Salmon R.	Riggins	150
Panther Creek	Shoup	40
Salmon River	Shoup	700
Salmon River	Salmon	600
Lemhi Creek	Mouth	125
Carmen Creek	Mouth	20
Hayden Creek	Mouth	50
Pahsimeroi River	Mouth	80
Salmon River	Challis	350
Challis Creek	Mouth	15
Imnaha River	River Mile 55	125 - 400
Grande Ronde River	Elgin	40 - 700
Wenaha River	Mouth	125 - 400
Wallowa River	Enterprise	150 - 250
Looking Glass Creek	Mouth	50 - 300
Catherine Creek		
North Fork	Mouth	15 - 50
South Fork	Mouth	8 - 45
Grande Ronde River	Oregon border to mouth	200 May-Aug. - 600 Sept.-Apr.
Asotin Creek	N&S Fks. confluence to mouth	50 May-Nov. - 100 Dec.-Apr.
Snake River	Upstream from Clearwater River	11,000
Clearwater River	Mouth	2,000
Potlatch Creek	Mouth	25
Palouse River	State line	50
Tucannon River	Headwater to mouth	100 May-Nov. - 200 Dec.-Apr.
Pataha Creek	USDA Forest Service border to Pomeroy	40 year round

1/ Points represent sites where water development may affect streamflows. Based upon data supplied by Washington Department of Game, Oregon State Game Commission, and Idaho Fish and Game Department (Aquatic Life Water Needs in Idaho Streams. IWRB - Planning Report Number 3, Boise, Idaho. 1969.).

Projected fish habitat improvement measures and practices proposed by two principal land managing Federal agencies are shown in table 52. In addition, a $4 million program for rehabilitating the South Fork Salmon River for anadromous fish spawning grounds has been proposed by the U.S.D.A. Forest Service.

Plans for non-Federal habitat improvement projects are incomplete and some may overlap the Federal plans. The extent of this overlap is not known. The non-Federal agency proposals include the projects mentioned below.

Proposed habitat improvements by 1980 in the Idaho portion of the subregion include removal of cascades in one stream reach, removal of jog jams at six sites, bypassing or altering waterfalls at 12 sites, provision of fish passage at one dam, structural improvements in streambeds in three stream reaches, and creation of two new lakes totaling 84 surface acres in the Iron Creek and Hat Creek drainages of Lemhi County. These improvements would provide a large amount of use annually at estimated capital costs of $537,000 and maintenance costs estimated at about $9,000 annually. About 1,500 miles of Idaho streams need structural improvements (such as gabions and sills) to improve riffle/pool ratios by 2020.

Control of nongame fish in 100 miles of Clearwater River and Dworshak Reservoir at an estimated cost of $125,000 will be needed by 1980.

One trout lake of over 100 surface acres is proposed for construction in Oregon at an estimated cost of $150,000. This lake would be constructed only if upstream anadromous fish runs are impossible to maintain.

Other fishery habitat improvement measures needed in Oregon include: (1) Increased streamflow in the Grande Ronde River from Island City to Elgin (river mile 99 through State Ditch to river mile 162) and in Catherine Creek from Lower Davis Dam to mouth of State Ditch (Catherine Creek river mile 0 to 14 and Grande Ronde River river mile 117 to 144), resulting in an increase of 1,000,000 angler-days each for resident fish and anadromous fish; (2) Structural stream improvements (such as gabions) in 120 miles in 9 streams to mitigate existing channel alterations at an estimated capital cost of $1,034,600 with annual operation and maintenance costs of $103,200.

Habitat improvements proposed in Washington include the construction and/or acquisition by 1980 of 13 lakes and ponds totaling 77 acres at an estimated cost of $144,000, plus one 7-acre lake by 2000, estimated at $10,000, and three more lakes totaling 18 acres to be constructed by 2020 at an estimated cost of $39,000. Cost

Table 52 - Fish Habitat Improvement Means, Subregion 6

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Stream improvement	mile	420	601.0	550	793.0	490	685.0
Spawning bed improvement	mile	81	121.5	156	234.0	181	271.5
Rough fish removal (streams)	mile	6	--	6	--	6	--
Stream channel preparation	mile	9	135.0	16	240.0	24	360.0
Lake improvement	acre	820	478.0	1,050	615.0	1,040	605.0
Rehabilitate S. Fk. Salmon River for salmon spawning	mile	200	4,000.0	--	--	--	--
Remove Lewiston Dam to facilitate fish passage	each	1	50.0	--	--	--	--
Sub-totals			5,385.5		1,882.0		1,921.5
Planning							
Fish stream surveys	mile	3,450	89.0	Not available		Not available	
Fish lake surveys	acre	6,130	31.0	Not available		Not available	
Sub-total			120.0				
Total			5,505.5				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Stream improvement	mile	324 1/	7,717	1/	627	1/	500
Nongame fish control (stream)	mile	100	125	--	--	--	--
Fish passage improvements	each	23	528	--	--	--	--
Fish lakes	acre	266	383	27	30	48	69
Land acquisition	acre	2,419	2,400	41	2	--	--
Sub-totals			11,153		659		569
Planning							
Fish stream surveys	mile	3,450	89	Not available		Not available	
Fish lake surveys	acre	10,000	50	Not available		Not available	
Sub-total			139				
Total			11,292				

1/ Incomplete listing of distance.

estimates are not available for other proposed developments in Washington, which include construction of one 5-acre lake by 1980, two lakes totaling 20 acres by 2000, and one 30-acre lake with no target date, plus acquisition of two 1-acre ponds and acquisition of 16 miles of public fishing streams by 1980.

The following measures are needed to improve fish passage in the Washington portion of the subregion: (1) reduce spillway height of the old Washington Water Power Company dam on Asotin Creek, (2) ladder Starbuck Dam on the Tucannon River, and (3) ladder falls and obstructions on the Palouse River.

Washington streams needing improved flows in this subregion include: Asotin Creek - confluence of North and South Forks to mouth (20 miles) - to 100 cfs December-April and 50 cfs May-November; Grand Ronde River - Oregon border to mouth (35 miles) to 600 cfs September-April and 200 cfs May-August; Pataha Creek - 15-mile reach upstream from Pomeroy to 40 cfs year-round; and Tucannon River - headwater to mouth to 200 cfs December-April and 100 cfs May-November.

Greater Harvest

Since waters in the central and southeastern parts of the subregion lie within mountainous and wilderness terrain, these areas with exceptions of mainstem streams receive light fishing pressure and are underharvested. Maximum utilization of streams and the numerous alpine lakes in the wilderness areas may not be reached for many years. However, back-country streams in the Blue Mountains of Washington are experiencing accelerated use and stream potential for wild trout will probably be realized there by 1980 or possibly sooner. Warmwater fish are abundant in the Snake and lower Clearwater Rivers, and to a lesser extent in the lower Grande Ronde River, and are underharvested.

Public access and increased harvest of resident fish will be derived from other acquisition and access programs proposed in Washington. Cost estimates are not available for these proposals, which by target date 1980 include acquisition of access to 43 miles of public fishing streams, streambank easements to 290 miles of riverbank exclusive of the Snake River, and easements to 411 miles of creeks exterior to Federal lands. Another proposal, to proceed as availability permits, covers acquisition of access to 11 lakes totaling 2,400 surface acres and acquisition of 33 miles of public fishing streams.

Other Washington proposals include acquisition of 5 miles of public fishing streams by 2000 and acquisition of an additional 40 miles of public fishing streams by 2020.

Augmentation of Supply

Increased production by hatchery rearing of steelhead will provide additional juvenile fish which will be available to trout fishermen. This may satisfy much of the future demands in the areas influenced by the steelhead hatcheries. Other waters within the subregion requiring increases in hatchery fish will have to be supplied by hatchery developments in other areas, perhaps chiefly in the Upper Snake Subregion. Two potential hatchery sites have been identified in the Lower Snake Subregion. One on Catherine Creek in Oregon could be developed at an estimated capital cost of $2.5 million with $240,000 annual operation and maintenance costs. It would handle 3,000 adult salmon and 8,000 adult steelhead. The purchase price of the other site is estimated at $15,000.

Introduction of new species should be considered if economically feasible. Establishment of a self-sustaining kokanee fishery in Dworshak Reservoir should be studied.

Hunting

Important deer and elk winter ranges are mainly in the valleys and foothills between 2,000 and 6,500 feet in elevation. Improved range management, including planting of browse, will be most effective if done in this elevational range. Reservation of big game winter range, and development of selected sites thereon, offer the main potential for providing for animals which would be displaced by water resource developments.

Future hunting of upland game will depend upon retaining and improving useful habitat on forest and range lands, and planned management of habitat on agricultural lands and on lands interspersed with agricultural lands. Where water development makes it possible to cultivate areas which were previously native grassland or timber, the hunting of upland game will shift toward the species found on agricultural lands.

Fur animals can be maintained and perpetuated as a product associated with programs designed mainly for fish and various groups of wildlife. Water resource planning should contribute importantly to fur animal habitat by maintaining protective cover along waterways and streambanks.

Small sanctuaries and feeding areas, interspersed with hunting areas, should be provided to obtain better control of waterfowl movements, and better distribution of the waterfowl harvest. Improved waterfowl hunter distribution could be achieved through lease or purchase of lands to provide hunting areas and access to huntable areas. Some waterfowl production habitat may be provided

by retaining suitable parcels of land in areas opened to agriculture by new irrigation development.

Habitat improvement on State and Federal wildlife areas will play a major part in controlling waterfowl movements by providing additional waterfowl food and resting areas.

Habitat preservation and development must be emphasized in wetland areas threatened by drainage or other uses. This will involve purchase of key areas as opportunities and funds permit. Approximately 5,000 acres of land will be needed for wetland preservation and development in Idaho. Waterfowl needs in Washington appear far more pressing because of the greater human population potential.

Some waterfowl production on private lands will result from irrigation in newly developed areas. Consideration for wetlands on private lands useful to waterfowl can be increased by providing financial assistance to landowners or operators.

Lands managed primarily for game will also benefit many species of nongame wildlife. Programs to benefit nongame wildlife should be incorporated into municipal, suburban, and recreation area plans.

Habitat Preservation

Wildlife habitat must be retained and kept available to meet future needs. This includes big game range, upland game habitat, protective cover along watercourses and streambanks useful to fur animals and other wildlife, waterfowl production habitat, and wetland habitat used by fur animals and other wildlife in addition to waterfowl. Zoning of flood plains should be accomplished between offset levees to provide wildlife habitat. In some instances land acquisition will be necessary but agreements concerning use and maintenance of the habitat will suffice in many cases.

Total land acquisition needs and costs are unknown, but the Idaho Fish and Game Department proposes acquisition of 25,000 acres of land by 1980 at an estimated capital cost of $3,700,000 and an annual operation and maintenance cost of $38,000. The purchase of a 300 square mile area in the Craig Mountain area for total public values should be considered.

A bighorn sheep management area is needed to conserve remnant herds in Morgan Creek and East Fork Salmon River drainages. It would require acquisition of 4,000 acres of private land, acquisition or dedication of 5,000 acres of State land, and dedication of 76,000 acres of Federal land at an estimated total cost of $1,225,000.

The Washington Department of Game anticipates the purchase of 37,440 acres of big game range and about 27,080 acres of upland bird and waterfowl lands before 2000. They also calculate that acquisition of hunting and limited management rights on some 68,400 additional acres of key lands for wildlife will be required to meet demand.

The opportunity for preservation of several units of deer and elk habitat in northeastern Oregon will require acquisition of approximately 91,000 acres of land.

Habitat Improvement

Needed habitat improvement for upland game, waterfowl, and fur animals largely can be accomplished by constructing fences, dikes, channels, ditches, potholes, and nesting structures, installing guzzlers, and by planting and manipulating food and cover. Big game habitat improvement includes winter range rehabilitation and drift fences and effective passageways across freeways and reservoirs for big game migrations.

Projected wildlife habitat improvement proposed by the two principal land managing Federal agencies are included in table 53.

Plans for non-Federal habitat improvement projects are incomplete, and some tentative plans undoubtedly overlap some of the Federal plans. The extent of this overlap is not known. Plans proposed by non-Federal agencies include the projects mentioned below.

Proposals for waterfowl habitat improvement measures by 1980 in Idaho include planting of 6,860 acres of land and marsh habitat and construction of three miles of ditches and channels, 50 potholes, 50 nest islands, and 500 nesting structures. These improvements will entail an estimated capital cost of $133,000. Operation and maintenance will cost about $13,000 annually. Benefits are estimated to be 67,000 man-days of hunting and an equal amount of non-hunting use.

Other habitat improvements proposed in Idaho include manipulation of 10,000 acres of big game winter range vegetation and construction of 40 miles of fence in the Salmon and Middle Snake drainages by 1980 at an estimated capital cost of $200,000 and annual maintenance cost of $14,500. The use of fire to manage 10,000 acres of winter range in the Clearwater drainage for maximum big game browse production offers an important opportunity to increase the carrying capacity of the range.

Table 53 - Wildlife Habitat Improvement Means, Subregion 6

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Seeding and planting	acre	8,750	223.0	11,260	286.0	11,250	285.0
Forage release & prescribed burning	acre	30,700	86.7	41,200	112.7	41,600	113.0
Key area fencing	mile	70	74.0	80	80.0	70	70.0
Permanent openings	acre	930	108.0	1,190	218.0	1,190	218.0
Wildlife food crops	acre	2,800	37.8	6,600	89.1	10,600	143.1
Guzzlers	each	30	30.0	30	30.0	20	20.0
Shallow impoundments and marsh improvement	acre	240	103.6	580	161.8	550	144.8
Develop potholes	each	10	5.0	--	--	--	--
Develop nesting facilities	each	90	5.0	120	6.0	110	6.0
Sub-totals			673.1		983.6		999.9
Planning							
Big game range analysis	acre	3,049,200	331.0	Not available		Not available	
Upland game habitat surveys	acre	6,600,000	264.(	Not available		Not available	
Habitat management plans	each	157	69.0	Not available		Not available	
Sub-total			664.0				
Total			1,337.1				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement	acre	40,250	1,385	40,000	340	40,000	340
Development on 5% of new irrig. lands	acre	40,000	400	40,000	400	86,000	860
Fencing	mile	156	150	--	--	--	--
Marsh development & food plantings	acre	--	--	6,800	133	--	--
Sub-totals			1,935		873		1,200
Planning							
Big game range analysis	acre	12,950.8[1/]	1,300	Not available		Not available	
Upland game habitat surveys	acre	15,057.0[1/]	500	Not available		Not available	
Sub-total			1,800				
Total			3,735				

1/ In thousands.

Cooperative measures proposed in Idaho (on Bureau of Land Management lands and other lands) include construction by 1980 of access roads, trails, and channel improvements at an estimated capital cost of $65,000 and annual maintenance estimated at $4,000. Another program in Idaho, targeted for 2000 and intended to improve access through posting of signs and related work, proposes an estimated capital cost of $150,000 and annual maintenance cost of $10,000.

In the State of Washington it is recognized that meeting the forecast demand for big game animals through habitat improvement based on current browse production technology is probably an insurmountable task. Therefore, enhancement will generally be limited to reclaiming ranges where big game is currently being excluded and efforts designed to bring about more compatible winter use by big game of privately owned or used ranges. Big game ranges can be upgraded by more intense management measures including:

(1) Reduce vegetative competition by burning, herbicides, and scarification.

(2) Coordinate timber management with big game needs by logging at closer intervals, thinning dense stands, and revegetating spur logging roads.

(3) Intensify farming of browse on key ranges by utilizing plant genetics, fertilization, cultivation, and irrigation.

(4) Zone key and critical winter ranges to prevent future encroachment by competitive developments.

(5) Give more consideration to big game in range management which is now distinctly livestock-oriented and often adversely affects wildlife on critical ranges.

(6) Increase use of mechanical devices including fencing, Dutch mirrors, and canal ramps. Closures are contemplated in the Blue Mountains to improve habitat where harassment of game, stemming from development of roads and campsites is a serious factor that limits wildlife use.

(7) Protect marsh-like areas along navigation channels in lower Snake River reservoirs from water level fluctuations.

Habitat development in northeastern Oregon will involve the construction of 56 miles of big game-proof fence, 60 miles of four-wire fence, rehabilitation of 18,000 acres of range on private lands, and development of three plots of waterfowl and upland game habitat totaling about 2,250 acres.

Detailed estimates of habitat improvement needs or estimated costs on privately owned lands are not available, but such costs would probably equal or exceed those described for State and Federal lands.

Some lands which may have agricultural potential also have great upland game bird potential which can be realized if land ownership patterns and land management plans are drawn up to supply the habitat needs of upland game concurrent with the requirements of cultivated crops. In addition, crop harvest and cultivation in agricultural areas could be timed to induce waterfowl to remain longer, thus providing added recreational benefit.

Upland game in newly developed agricultural areas can be a continuing crop if five percent of the land is held in public ownership specifically for upland game habitat and for public use in hunting or other recreational activities. Providing for hunting and other recreational use of lands in agricultural areas at public expense has seldom been possible under the traditional system of private land ownership. However, there is now an opportunity to supply a public need by designing the pattern of land ownership and land use so that land for upland game habitat will be provided in much the same way that land has been made available for public roads in the past. During the era of development of newly watered lands this could be done by retaining portions of each area in public ownership when title on the remainder is passed to private ownership. It is in the public interest that lands be made available for wildlife use.

Greater Harvest

If present game ranges remain available, mule deer, white-tailed deer, elk, black bear, and upland game can provide major increases in hunting in central and southeastern parts of the subregion in the future. Big game species other than deer, elk, and bear will support only minor increases in hunting. Additional hunting of deer, elk, and bear will be achieved largely through refined management which will permit a maximum annual harvest. The base for expanded hunting of mule deer and elk exists mainly in areas which are remote from centers of human population and to which access is difficult. In the Washington portion of the subregion perhaps forest grouse, quail,and chukar offer the best opportunities for greater harvest.

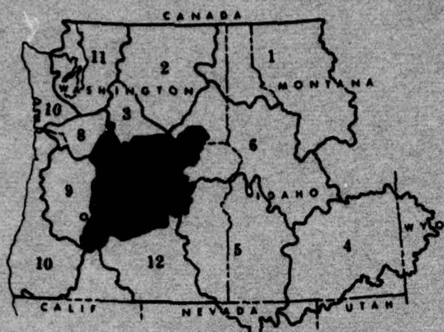
Provision of public access to upland game and waterfowl hunting areas is expected to eventually require long-term leases covering approximately 20,000 acres of private lands in Union County, Oregon.

Augmentation of Supply

Artificial production to provide big game for public hunting is not generally feasible. Hence, it is not expected to become a major part of the big game program. On some restricted big game winter ranges where competitive uses limit the carrying capacity of the remaining range, winter feeding of big game is likely to become more important in the future.

Introduction or reintroduction of bighorn sheep into the Middle Snake drainage and grizzly bear into the Upper Selway drainage offers potential for increasing the supply of these uncommon species. Studies should precede possible introduction to determine ecological feasibility.

Since upland game species are not hunted to capacity, it is anticipated that wild stocks will largely meet the needs of the future in much of the subregion without augmentation by artificial production. However, under present programs about 10,000 cock pheasant are released annually in Washington. It is predicted that this release program will expand by 17 percent in 1980, 42 percent by 2000, and 66 percent by 2020. Two rearing units, each with a capacity for 2,000 upland game birds, will eventually be needed in northeastern Oregon. Proper management of existing habitat could augment waterfowl and fur animal supplies in the future.



LOCATION MAP

SUBREGION 7

S U B R E G I O N 7, M I D C O L U M B I A

GENERAL DESCRIPTION OF SUBREGION

Mid Columbia Subregion, located in northcentral Oregon and southcentral Washington, has a drainage area of about 30,000 square miles of which approximately 5,500 square miles are in the State of Washington. The Washington portion is the area drained by all the streams entering the north bank of Columbia River from Bonneville Dam upstream to Pasco plus the Walla Walla River drainage north of the Oregon-Washington line. The Oregon portion is composed of the streams entering the south bank of Columbia River from Bonneville Dam upstream to the Oregon-Washington line plus the portion of Walla Walla River drainage in the State of Oregon.

The subregion is sheltered from the tempering, humid influence of the Pacific Ocean by the Cascade Range, so it has a more continental type climate than subregions to the west. Average precipitation is about 12 inches, but varies from over 130 inches at the crest of the Cascades to less than 8 inches at several points near the Columbia River and in the upper Deschutes River drainage.

Forests, mostly open ponderosa pine stands, are restricted to the more humid areas such as the eastern slope of the Cascade Range, the Blue Mountains, and outlying ranges such as Ochoco and Maury Mountains. Intervening drier sites support juniper, sagebrush, bitterbrush, saltbrush, and other semidesert shrubs overstorying grasslands.

Much of the arable land is in the north half of the subregion, is dry-farmed, and produces grain. Principal irrigated areas are in the Umatilla-Pendleton area, and the Walla Walla and Deschutes River drainages.

Much of the subregion has a very sparse population.

HISTORY OF FISH AND WILDLIFE

The Columbia River area supported a substantial Indian population before white settlement. Celilo Falls and other locations where fish passage was restricted were centers of Indian populations. Indian subsistence and commerce centered around the salmon during this period and salmon products were commonly traded with distant tribes.

Early white settlers traded with the Indians and eventually developed more efficient methods for taking salmon. As more white settlers entered the area, water development projects, placer mining, agricultural land development, and resultant pollution began to alter and destroy anadromous fish habitat and runs.

In recent years, large hydroelectric dams have been constructed on the Columbia River and its tributaries within the subregion. As a result, most of the major anadromous salmonid spawning areas of the river were destroyed. The Celilo Falls Indian fishing grounds were also inundated, but Indians continue to fish the Columbia River with modern equipment.

Fish passage facilities have been developed at Columbia River dams in an effort to allow fish to reach the remaining spawning areas. Fish passage has been partially successful; however, loss of both adult and juvenile fish at the dams and within the reservoirs is still a serious problem.

Several other streams in the subregion have been affected by construction of power and irrigation dams to the detriment of anadromous fish; however, reservoirs on many of the streams provide good resident trout and/or warmwater fisheries. The trout fisheries usually have to be maintained by continuous stocking of artificially propagated fish.

Early trappers and explorers did not find an abundance of furbearers, but did note the presence of bighorn sheep, antelope, deer, elk, sage grouse, sharp-tailed grouse, and a variety of waterfowl. Although heavy hunting reduced numbers of some species, the alteration and destruction of habitat has had the greatest impact on wildlife. Domestic sheep grazing began about 1880. Range competition followed and this, in combination with diseases, resulted in the disappearance of bighorn sheep from the subregion. Land cultivation caused the disappearance of sharp-tailed grouse. Antelope were reduced to remnant populations by 1910. Sage grouse populations declined drastically after about 1920. Deer and elk decreased to all time lows about the turn of the century but have increased rapidly since the 1930's. Antelope have also increased in recent years.

The introduction of exotic wildlife began in the late 1800's when ring-necked pheasant and valley quail were released. Hungarian partridge were introduced on a number of occasions, chukar were successfully introduced in the 1950's, and wild turkey in the early 1960's. These species remain in varying numbers and provide hunting.

Fish and wildlife management began during the 1800's with the passage of a number of laws and regulations in Oregon and Washington. Little actual management occurred prior to the late 1930's when trained personnel and additional funds became available.

PRESENT STATUS

Fish and wildlife present in the subregion are anadromous and resident game fish, big game, upland game, fur animals, waterfowl, and other wildlife.

Steelhead trout, greatly sought trophy fish. (Bureau of Commercial Fisheries)

Fish and wildlife resources of the subregion are of major economic and recreational importance. Estimates based upon averages in the 1965 National Survey of Fishing and Hunting indicate that annual expenditures associated with recreational use of fish and wildlife, excluding anadromous fish, within the subregion amount to about $13,200,000. These activities provided about 2,069,000 man-days of fishing and hunting in 1965.

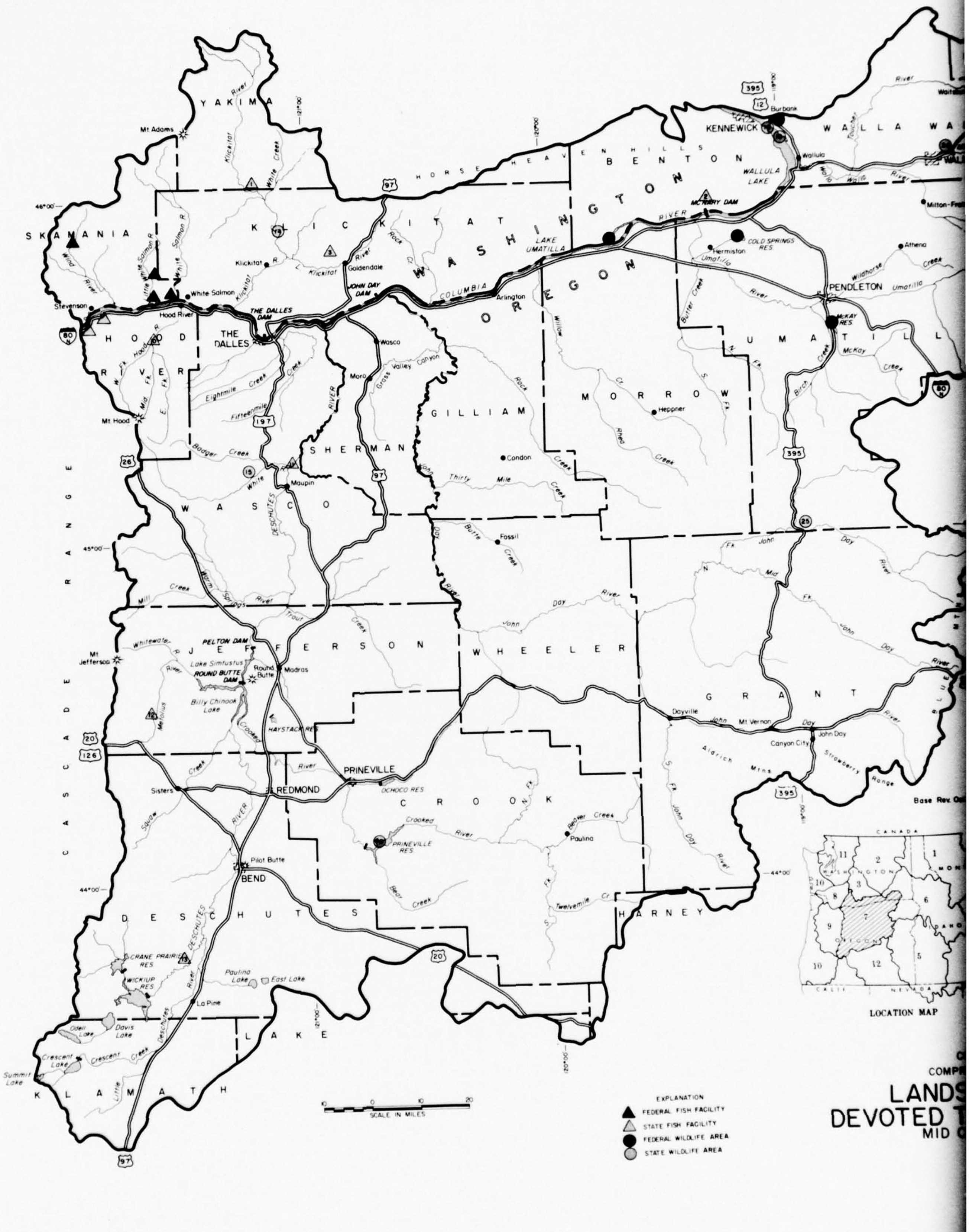
Many factors affect the fish and wildlife resources of the subregion, but most pronounced are activities that drastically alter fish and wildlife habitat. Figure 31 locates and identifies major State and Federal fish and wildlife lands and facilities. These installations and areas are of special importance to one or more kinds of fish and wildlife.

FIGURE 31. EXPLANATION

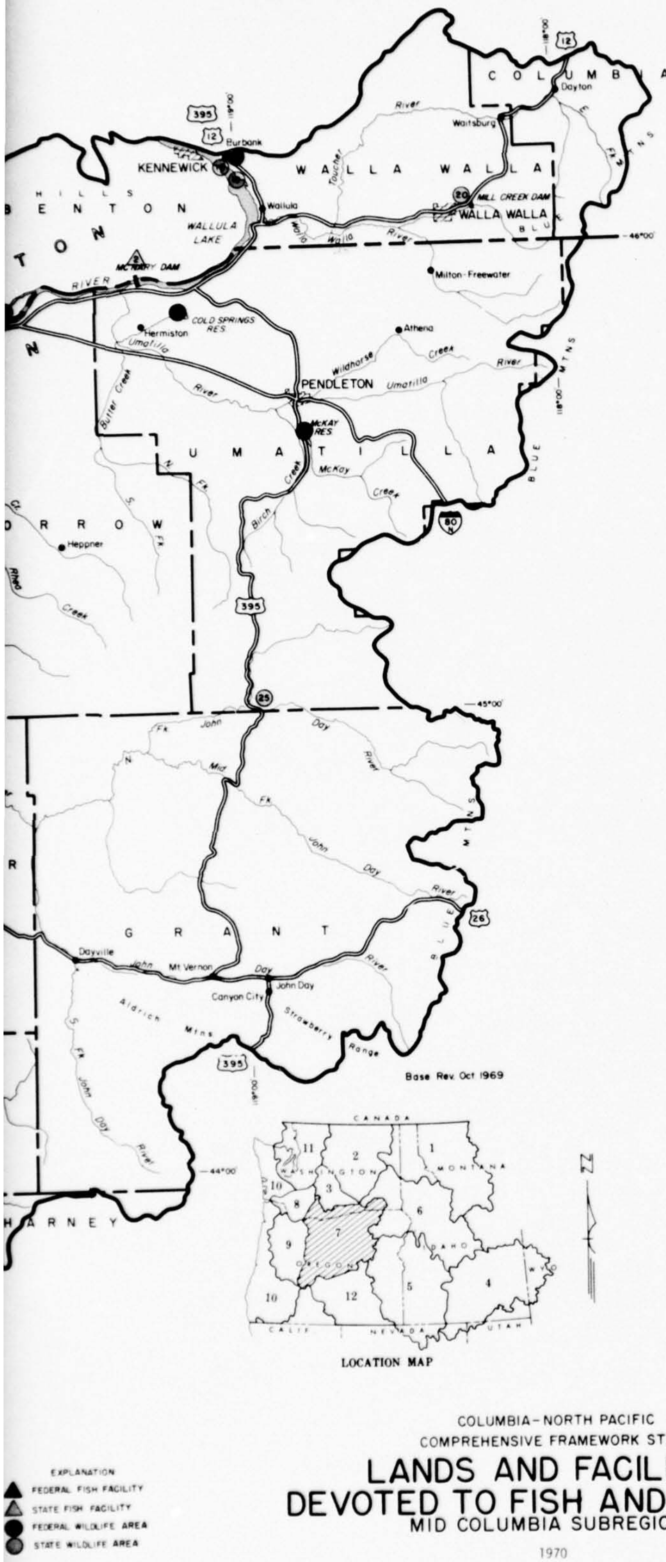
Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	Klickitat State Salmon Hatchery		88,646
2	McNary Spawning Channel		1/
3	Goldendale Hatchery		48,000
4	Carson National Fish Hatchery		97,468
5	Willard National Fish Hatchery		106,096
6	Little White Salmon National Fish Hatchery		84,390
7	Spring Creek National Fish Hatchery		42,403
8	Oxbow Salmon Hatchery		36,286
9	Cascade Salmon Hatchery		97,874
10	Hood River Hatchery		24,068
11	Oak Springs Hatchery		159,353
12	Wizard Falls Hatchery		86,566
13	Fall River Hatchery		9,746
14	Klickitat Wildlife-Recreation Area	5,032	
15	White River Game Management Area	17,016	
16	Prineville Res. Mgt. Area	3,360	
17	McNary National Wildlife Refuge	2,867	
18	Kennewick Game Farm	40	
19	McNary Wildlife-Recreation Area	8,946	
20	Walla Walla Game Farm	43	
21	Umatilla National Wildlife Refuge	29,370	
22	Cold Springs National Wildlife Refuge	3,117	
23	McKay Creek National Wildlife Refuge	1,836	
24	Bridge Creek Game Management Area	15,375	

1/ 176,100 fry released.

1


YAKIMA
SKAMANIA
KLICKITAT
BENTON
WALLA WA
WASHINGTON
OREGON
HOOD RIVER
WASCO
SHERMAN
GILLIAM
MORROW
UMATILLA
JEFFERSON
WHEELER
GRANT
CROOK
DESCHUTES
HARNEY
LAKE
KLAMATH
CASCADE RANGE
HORSE HEAVEN HILLS
Mt Adams
Mt Hood
Mt Jefferson
Stevenson
White Salmon
Hood River
Klickitat
Goldendale
THE DALLES
THE DALLES DAM
JOHN DAY DAM
MCNARY DAM
KENNEWICK
Burbank
Wallula
WALLULA LAKE
LAKE UMATILLA
COLUMBIA RIVER
Arlington
Hermiston
COLD SPRINGS RES
Umatilla
PENDLETON
Athena
Milton-Free
McKAY RES
Wasco
Moro
Grass Valley Canyon
Condon
Heppner
Fossil
Maupin
DESCHUTES RIVER
PELTON DAM
Lake Simtustus
ROUND BUTTE DAM
Round Butte
Madras
Billy Chinook Lake
HAYSTACK RES
PRINEVILLE
OCHOCO RES
PRINEVILLE RES
REDMOND
Sisters
Pilot Butte
BEND
Paulina
Dayville
Mt Vernon
John Day
Canyon City
Aldrich Mtns
Strawberry Range
Twelvemile Cr
CRANE PRAIRIE RES
WICKIUP RES
Paulina Lake
East Lake
La Pine
Odell Lake
Davis Lake
Crescent Lake
Summit Lake
Eightmile Creek
Fifteenmile Creek
Badger Creek
Mill Creek
Warm Springs River
Trout Creek
Whitewater R
Metolius
Crooked River
Squaw Creek
Beaver Creek
Bear Creek
Willow Cr
Butter Creek
Birch Creek
McKay Creek
Wildhorse Creek
Thirty Mile Creek
Rock Creek
Rhea Creek
N Fk John Day River
Mid Fk John Day River
S Fk John Day River
Walla Walla River
Touchet River
46°00'
45°00'
44°00'
121°00'
120°00'
118°00'
EXPLANATION
FEDERAL FISH FACILITY
STATE FISH FACILITY
FEDERAL WILDLIFE AREA
STATE WILDLIFE AREA
SCALE IN MILES
10 0 10 20
LOCATION MAP
CANADA
WASHINGTON
OREGON
CALIF
NEVADA
Base Rev. O
COMPI
LANDS
DEVOTED T
MID C

2



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

MID COLUMBIA SUBREGION 7

1970

FIGURE 31

Anadromous Fish

Significant numbers and kinds of anadromous fish are produced in the Mid Columbia Subregion; however, most of the production is harvested outside the subregion. For this reason, a regional analysis of the present status is presented in the "Regional Summary."

Resident Fish

Resident game fish of the Mid Columbia Subregion include rainbow, cutthroat, brook, brown, golden, and lake trouts, Dolly Varden, mountain whitefish, kokanee, Atlantic salmon, bass, bluegill, crappie, and catfish. Nongame fish include squawfish, carp, sucker, chiselmouth, and roach.

Habitat

The most important fish habitat is the Columbia River with its tributaries, Deschutes, John Day, and Umatilla Rivers in Oregon; White Salmon and Klickitat Rivers in Washington. Several lakes have been formed by backwaters of the Columbia River in Washington. These, along with backwater lakes along the Oregon shore, produce warmwater fish, as does Cold Springs Reservoir in the Umatilla River drainage. Many lakes at higher elevations support trout fishing as do some backwaters in both States. McKay Reservoir in the Umatilla River drainage, and Pelton, Round Butte, Prineville, Ochoco, Crane Prairie, and Wickiup Reservoirs in the Deschutes drainage also furnish trout. In this subregion, the Columbia River consists of four large reservoirs. An estimated 2,530 farm ponds have been constructed on private land. About 5 percent of these ponds are managed for fish production.

Use

Approximately 1,047,000 angler-days are expended annually for resident fish. Many who fish in this subregion are from other areas, but data on this use are not available. Table 54 shows an analysis of sport fishing use.

Table 54 - Estimated Sport Fishing Use of Resident Fish, Subregion 7, 1965[1/]

Waters	Angler-Days Oregon	Angler-Days Washington	Totals
Streams	398,070	103,450	501,520
Lakes and Ponds	210,408	91,029[2/]	301,437
Reservoirs	244,528	--	244,528
Totals	853,006	194,479	1,047,485

1/ Based on data obtained from fish and game agencies of respective States.
2/ Reservoirs included with lakes and ponds.

Angling for resident fish is one of the major recreation outlets for inhabitants of the subregion and is of considerable economic significance since it attracts fishermen from many other areas.

Expenditures for tackle, gear, and travel amounted to about $5,200,000 in 1965.

Sport catch of salmonids exceeds natural production in most accessible areas, and stocking of fish is required. Unstocked waters support native fish populations but generally not in numbers capable of supporting a significant increase in fishing. Warmwater fish are underharvested and could supply a significant increase in angler use, particularly in the Columbia River and its impoundments.

Factors Affecting Resource

Annual releases of about 262,700 pounds of trout are made in the subregion by fishery agencies. One Federal and four State fish hatcheries located in the subregion produce trout.

Factors adversely affecting resident fish are municipal pollution and irrigation return flows. Poor environment caused by low summer and fall streamflows is often aggravated by warm, turbid water returning to the streams from irrigated fields. High summer air temperatures and irrigation withdrawals allow water temperatures of the streams to reach critical levels.

Some reservoirs and streams are infested with nongame fish, which contributes to a decline in fishing quality. Consequently, periodic chemical rehabilitation followed by restocking with game fish is often necessary.

Trout liberation create new fisheries, augment natural production, and help satisfy angler demand. (Oregon State Game Commission)

In the past, mining and dredging destroyed trout habitat in some streams, and the devastation is still apparent. Steps are being taken to improve the habitat. Stream improvement work has been accomplished on nearly 150 miles of small tributaries within the national forests during the period 1965-1968. This work included streambank stabilization, stream channel clearance, and other fish habitat improvement. The Bureau of Land Management and the State fish and game agencies also have stream improvement programs. Aids to sport angling, such as streambank easements, parking areas, and boat ramps are generally used to the maximum during the early part of the trout fishing season.

Big Game

Mule deer, black-tailed deer, Rocky Mountain elk, and black bear are the principal species. Pronghorn antelope, mountain goat, and white-tailed deer are present in small numbers.

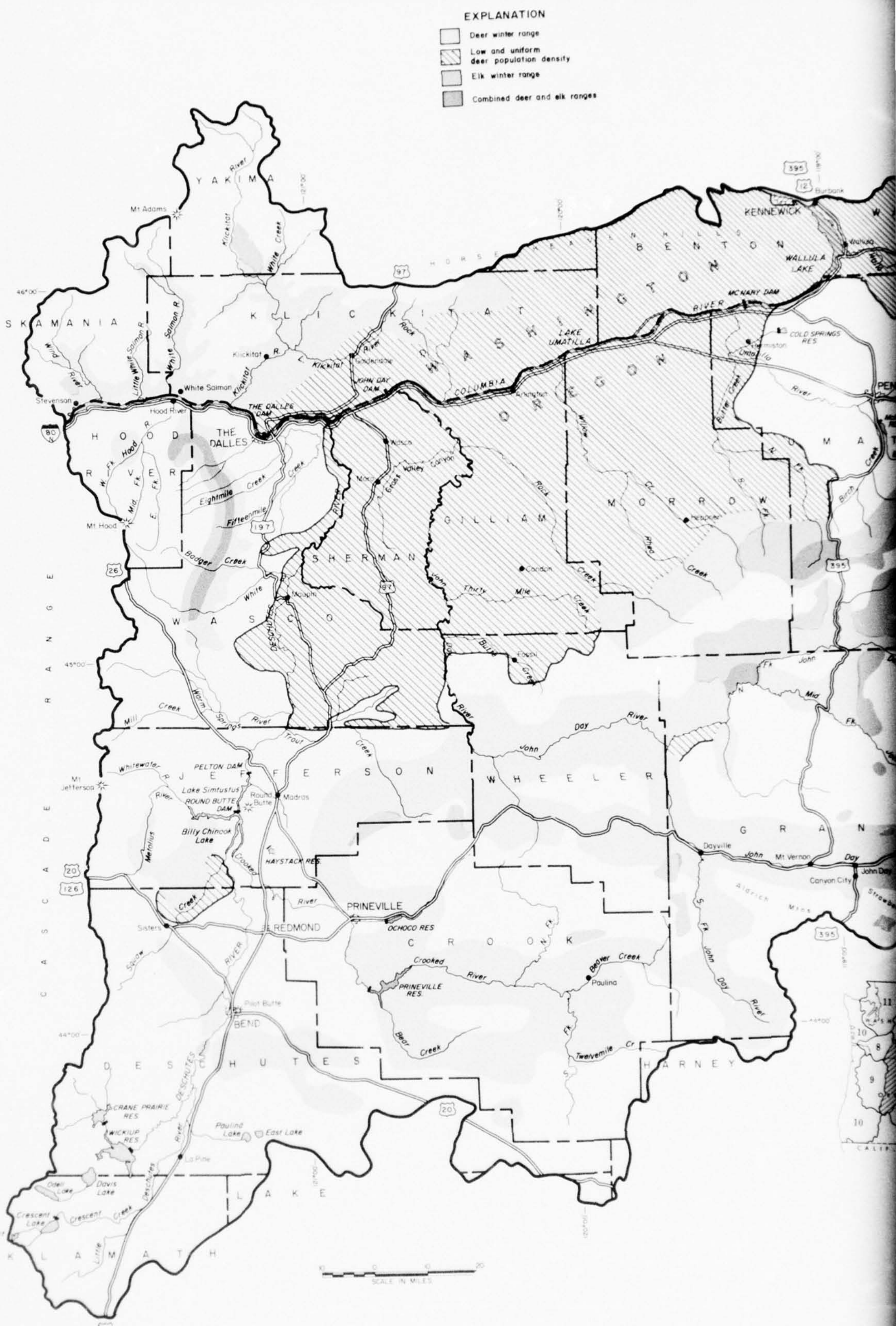
Mule deer occupy the entire area except for urban and intensively farmed areas, and a narrow fringe near the summit of the Cascades along the extreme west side of the subregion. This fringe

area is black-tailed deer range. Rocky Mountain elk range the Blue Mountain area in the south and east portion of the subregion. This is mostly open ponderosa pine woodland with thick lodgepole pine stands interspersed. Elk are also common in the northwestern portion of the subregion in Oregon on the eastern slope of the Cascade Range. Black bear are in the forested mountain area. Pronghorn once ranged over most of the subregion in Oregon, but are now found only along the southeast edge in Deschutes, Crook, and Grant Counties. Mountain goat are in the highest, rockiest sites of Washington's Cascade Range in the northwestern corner of the subregion. Relict populations of white-tailed deer are found on the eastern slope of Mt. Hood and in the upper Metolius River drainage of Oregon; these animals also inhabit Walla Walla and Columbia Counties, Washington.

Subregion forest lands support significant numbers of black bear. (Oregon State Game Commission)

Habitat

Highest quality summer habitat is found in open timber and range areas where forage and water are most abundant. Winter range for deer and elk is located at lower elevations. Such range is critical because the animals are concentrated on small areas and the food quality and quantity is much less than during the summer.


EXPLANATION
Deer winter range
Low and uniform deer population density
Elk winter range
Combined deer and elk ranges
YAKIMA
SKAMANIA
KLICKITAT
WASHINGTON
BENTON
OREGON
HOOD RIVER
WASCO
SHERMAN
GILLIAM
MORROW
JEFFERSON
WHEELER
GRANT
CROOK
DESCHUTES
HARNEY
LAKE
KLAMATH
CASCADE RANGE
Mt Adams
Mt Hood
Mt Jefferson
Stevenson
White Salmon
Hood River
THE DALLES
THE DALLES DAM
JOHN DAY DAM
McNARY DAM
KENNEWICK
WALLULA LAKE
LAKE UMATILLA
COLUMBIA RIVER
COLD SPRINGS RES
Klickitat
Condon
Maupin
Madras
Round Butte
PELTON DAM
Lake Simtustus
ROUND BUTTE DAM
Billy Chinook Lake
HAYSTACK RES.
PRINEVILLE
OCHOCO RES
PRINEVILLE RES.
REDMOND
Sisters
Pilot Butte
BEND
CRANE PRAIRIE RES
WICKIUP RES
Paulina Lake
East Lake
La Pine
Odell Lake
Davis Lake
Crescent Lake
Summit Lake
Dayville
Mt Vernon
John Day
Canyon City
Paulina
Aldrich Mtns
John Day River
Crooked River
Deschutes River
Metolius
Whitewater
Trout Creek
Fifteenmile
Eightmile Creek
Badger Creek
Mill Creek
Warm Springs River
Beaver Creek
Bear Creek
Twelvemile Cr
Thirty Mile Creek
Willow Creek
Butter Creek
Rock Creek
Crescent Creek
Squaw Creek
Little White Salmon R
White Salmon R
Wind River
46°00'
45°00'
44°00'
SCALE IN MILES
0 5 10 20

2

LOCATION MAP

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

DEER AND ELK RANGES

MID COLUMBIA SUBREGION 7

1970

FIGURE 32

Often these lands are privately owned. Figure 32 shows important range for mule deer and elk.

Use

Hunting effort in 1965 amounted to about 669,000 man-days. A large portion of the hunting pressure was from persons living outside the subregion. Bear hunting was largely incidental to deer and elk hunting. An analysis of big game hunting use is presented in table 55.

Table 55 - Estimated Hunting Use of Big Game, Subregion 7, 1965 1/

	Hunter-Days		
Species	Oregon	Washington	Totals
Deer	383,000	134,000	517,000
Elk	118,500	26,500	145,000
Bear	5,000	2,000	7,000
Totals	506,500	162,500	669,000

1/ Based on data obtained from fish and game agencies of respective States.

Big game provided about 65 percent of the hunting in the subregion in 1965 and resulted in a total expenditure of nearly $6,400,000.

Deer and bear could probably provide additional hunting without harm to the resource. However, much of this potential exists in inaccessible areas or as small insignificant populations not likely to be hunted. Elk are hunted to near maximum.

Factors Affecting Resource

The most serious problem has been the destruction or deterioration of winter range. Overgrazing by livestock and big game has been detrimental to habitat in many areas. Other important detrimental factors include sagebrush control, absence of wildfire, and water development projects.

Management of big game is accomplished by State regulations and habitat management. It includes operation of three State wildlife management areas. Other beneficial activities include controlled grazing, predator control, construction of waterholes,

range rehabilitation, and in some areas where dense timber crowds out desirable food plants, logging, or fire. Several State and Federal agencies are conducting studies to determine means of improving range for big game and livestock.

Upland Game

Principal upland game of Mid Columbia Subregion are ring-necked pheasant, mountain and valley quail, blue and ruffed grouse, chukar, Hungarian partridge, mourning dove, and rabbit.

Habitat

Ring-necked pheasant, Hungarian partridge, and mourning dove are most abundant in agricultural areas, especially in and near grainfields and irrigated areas. Chukar are primarily inhabitants of arid, rocky canyons and slopes vegetated with cheatgrass and sagebrush. Grouse are present in greatest numbers in the foothills and mountains. Valley quail are distributed throughout the subregion near water, brushy draws, and around agricultural lands. Mountain quail inhabit brushy foothill draws. Rabbit occur in a variety of habitats, and are more widely distributed than any other species of upland game. Much of the hunting pressure was by persons living outside the subregion.

Use

Hunting effort amounted to about 250,000 man-days. Table 56 shows an analysis of upland game hunting use.

Table 56 - Estimated Hunting Use of Upland Game, Subregion 7, 1965 1/

Species	Hunter-Days		
	Oregon	Washington	Totals
Pheasant	60,000	38,000	98,000
Quail	31,000	19,000	50,000
Grouse	1,500	19,500	21,000
Chukar	24,000	15,000	39,000
Hungarian Partridge	9,500	2,500	12,000
Mourning Dove	12,500	3,500	16,000
Band-tailed Pigeon	400	2,600	3,000
Rabbit	--	11,000	11,000
Totals	138,900	111,100	250,000

1/ Based on data obtained from fish and game agencies of respective States.

Upland game provided about 25 percent of the hunting in the subregion in 1965. Expenditures for this hunting amounted to about $1,200,000.

Chukar afford quality sport for the hardy hunter. (Oregon State Game Commission)

Hunting pressure could be greater during years when populations of some species of upland game are high. Much of this potential is on public lands, but access and remoteness often prevent full utilization.

Factors Affecting Resource

Factors limiting numbers and distribution of upland game include lack of water, lack of cover, and destruction of habitat by such activities as urban and industrial expansion, water development projects, land clearing, overgrazing, and certain agricultural practices.

Management activities benefiting upland game are conducted on five national wildlife refuges, two State wildlife management areas, and two game farms. In addition, the Washington Department of Game and the Oregon State Game Commission conduct habitat improvement programs. Irrigation has extended the distribution of

upland game in many areas by providing food and water on lands that were once semi-desert. Several State and Federal agencies encourage and assist landowners to develop food, water, and cover for upland game.

Fur Animals

Muskrat, beaver, mink, raccoon, bobcat, and coyote are important fur animals. Species of less importance include river otter, skunk, fox, badger, and weasel.

Habitat

Beaver, muskrat, mink, and raccoon frequent water areas. The other species are found in suitable habitat throughout the subregion.

Use

Approximately 9,000 animals were trapped during the 1965-1966 season. Muskrat pelts made up about 75 percent of the total harvest. The remaining 25 percent were mostly beaver and mink. Harvest of some species could be greater, but many of the "surplus" animals have low pelt values or are present in remote areas difficult to reach during winter months.

Pelts from the subregion had a value of more than $32,000 during the 1965-1966 season.

Factors Affecting Resource

Fur value is the principal factor influencing use of the resources. There has been some loss of habitat in impoundment sites and land drainage projects. Management of the resource is limited primarily to harvest regulation.

Waterfowl

Mid Columbia Subregion attracts large numbers of waterfowl, especially mallard, American widgeon, pintail, and Canada goose.

Habitat

Highest quality habitat is found in the northern portion of the subregion and consists of the Columbia River and tributaries and adjacent agricultural lands. This area supports large numbers of migrating birds, and is an important nesting area for Canada geese. Lakes, rivers, and reservoirs in the southern and mountainous areas serve as duck resting and nesting habitat.

Use

Hunter use in 1965 was about 63,000 man-days. Many of the hunters came from outside the subregion. The waterfowl resource could support a moderate increase in harvest. Table 57 presents an analysis of this use.

Table 57 - Estimated Hunting Use of Waterfowl, Subregion 7, 1965 1/

Waterfowl Group	Hunter-Days Oregon	Hunter-Days Washington	Hunter-Days Totals
Ducks	29,500	12,500	42,000
Geese	18,000	3,000	21,000
Totals	47,500	15,500	63,000

1/ Based on data obtained from fish and game agencies of respective States.

Waterfowl provided approximately 6 percent of the total hunting in 1965. This resulted in an estimated expenditure of $400,000.

Factors Affecting Resource

A number of factors, some beneficial, some detrimental, have affected waterfowl habitat. Impoundments on the Columbia River have destroyed most of the nesting habitat for a population of resident Canada geese. New waterfowl resting and feeding habitat has been created in Lake Umatilla, Wallula Lake, McKay Reservoir, and Cold Springs Reservoir and, to a lesser extent, in the other impoundments. A few wetlands have been destroyed by drainage. New habitat has been created in seeps and sumps in irrigated sections.

Waterfowl benefit from the State management area, and the Federal refuges. Large acreages of grain in the dryland farming areas provide an abundance of food for waterfowl. As a conservation measure, a large stretch of the Columbia River has been closed by the States to hunting of waterfowl.

Major factors affecting waterfowl hunting are weather and access. Mild weather often delays flights from the north and restricts early season hunting. Restricted access to some private lands and gun clubs minimizes use of the resource.

Public hunting is provided on the State and Federal waterfowl management areas. Public access to rivers, lakes, and impoundments permits hunters to reach many good hunting sites via boat.

Other Wildlife

Many other species of wildlife are present. Some of these are important because they conflict with man's interests, are hunted, or have an esthetic value. Rats, mice, moles, starlings, and blackbirds destroy foodstuffs or interfere with agricultural pursuits. Feral pigeon and a number of other species are hunted for recreation. Many species of songbirds and waterbirds of esthetic importance are present and provide recreation for many people. Small numbers of bald eagle are present.

Virtually the entire subregion is inhabited by one or more forms of wildlife of this group. Hunting for unprotected species amounts to about 40,000 man-days annually, which is 4 percent of the subregion total. Hunting could be increased significantly on many species. The greatest value of "other wildlife" is in photography and observing. The many factors affecting big game, upland game, fur animals, and waterfowl also influence this group.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

Satisfying future needs in this subregion will not be as difficult to achieve as in some others. However, the need for increasing fish and wildlife populations to supply future demand is imperative. Private land could play an important role in fish and wildlife enhancement.

Fishing

Subregion 7 will need to accommodate an additional 1,467,000 angler-days for resident fish by year 2020. It must continue to provide anadromous fish for the sport and commercial fisheries of the region. The subregion can satisfy all of the fishing needs for resident fish and a significant portion of the angling needs for anadromous fish; however, to accomplish this will require an integrated plan of development and habitat preservation.

Existing and planned programs of State and Federal agencies are expected to conserve or increase fish resources in the Mid Columbia Subregion. These should be worked into an integrated plan with other water uses. Defining specific costs and details of an integrated plan will require more study. Private ponds and reservoirs could supply some of the demands for resident game fish.

Habitat Preservation

Preservation of habitat for fish consists mainly of the protection of stream habitat. Channeling, dredging, clearing of streamside brush, and dam construction destroy the stream environment. Good stream fishing is fast disappearing, and certain stream reaches should be protected from further encroachment. An effort should be made to enhance each stream for fish. Some streams will require flow regulation to maintain a year-round desirable water level. The remaining natural portions of the following streams and rivers should be preserved:

- Quinn River - all
- Rock Creek (Washington) - all
- Metolius River - from origin to Billy Chinook Lake
- Deschutes River - all free flowing portions
- Klickitat River - all
- Big White Salmon River - all
- Crooked River - from Prineville Dam to Billy Chinook Lake
- Wind River - all
- John Day River - from town of Dayville to mouth
- North Fork John Day River - all
- Little Deschutes River - from Mowich to mouth
- Umatilla River - from Umatilla National Forest boundary to mouth
- Touchet River - all
- Walla Walla River - all

Habitat Improvement

Low streamflows often create uninhabitable conditions for fish and other aquatic animals. A possible solution would be construction of small storage impoundments on tributary streams to augment downstream flows during critical low-flow periods. These may be used to regulate some peak floods. Another alternative would be to line the irrigation canals in the Deschutes area, to reduce water loss through the porous substrata. There is a possibility of trading pumped water from the Columbia River for stream irrigation rights in some areas. Many more alternatives exist; however, each stream would need to be studied individually to determine the conditions required to sustain and improve desired fish populations. Improved flows and water quality would enhance fish resources in the following rivers:

John Day River
North Fork John Day River
Middle Fork John Day River
Little Klickitat River
Deschutes River (upstream from Lake Billy Chinook)
South Fork John Day River
Umatilla River
Walla Walla River (downstream from Milton-Freewater)
Touchet River (downstream from Dayton)

During the summer when irrigation withdrawals and temperatures are the highest, many other streams in the subregion need improved flows. State agencies have catalogued and recommended preliminary optimum flows for the major streams in Oregon. Establishing optimum streamflow patterns would make possible satisfaction of the future needs for stream fishing through the year 2000 provided the present management and stocking are maintained.

Streambed structures such as digger logs, gabions, and sills are needed in many smaller streams. These structures create pools and riffles which provide habitat for aquatic organisms and resting and rearing areas for fish.

Pollution in the form of silt, sawmill wastes, and municipal wastes should be eliminated in the following streams by 1980:

John Day River (silt)
  Middle Fork John Day (silt)
  South Fork John Day (silt)

Deschutes River
  Downstream from Wickiup (silt)
  Downstream from Crane Prairie (silt)
  Downstream from Bend (log debris)

Little Deschutes River
  Downstream from Gilchrist (log debris)

Umatilla River (river mile 45-54 - sawmill wastes)

Walla Walla River downstream from Milton Freewater, Oregon, and Walla Walla, Washington (municipal-industrial waste)

Mill Creek from City of Walla Walla treatment plant downstream to mouth (municipal-industrial waste)

Control of other pollutants, including the use of selected land treatment measures in the watershed, would increase survival and growth of fish, thus increasing the quality of the fishery.

Benefits would occur also to general recreation, wildlife, and to the total human environment.

Little can be done to natural lakes with regard to habitat improvement and water resource development. Reservoirs are susceptible to water level fluctuations, temperature problems, and other factors which affect fish populations. Establishment of stable or minimal reservoir fluctuations (5 feet or less) would allow a littoral zone to become established and encourage growth of aquatic plants and fish food organisms. Survival and growth of resident fish would increase, thus increasing both quality and utilization of the resource by 25 to 50 percent. If this stabilization of water level and subsequent improvement of habitat were accomplished, future requirements for reservoir fishing could be satisfied through year 2020. Reservoir stabilization also would benefit wildlife and general recreation.

Nongame fish are a perennial problem in reservoirs, natural lakes, and streams. Chemicals which control certain species of nongame fish without harm to game fish are being discovered. Fish resources can be increased in quantity and quality in reservoirs and streams with selective control. Most streams have an abundance of nongame fish which prey upon and compete directly with game fish. A broad program of treatment should be instigated to include all streams by 1980. Large reservoirs contain too much water to effectively treat for nongame fish; however, with future research and development of selective toxins, it may become feasible to control nongame fish populations in large water bodies.

The streams listed below have suitable spawning or rearing habitat in their upper reaches that is blocked to fish passage. Passage at these barriers should be provided by 1980.

White River (falls)
Jordan Creek (Deschutes River tributary) (falls)
Big Creek (North Fork John Day River tributary) (rockslide)
Deschutes River (Tumalo Feeder Canal Dam)
(City Dam, river mile 166.3)
(B-S Dam, river mile 167.5)
Little Deschutes River (Gilchrist Dam)
Mill Creek (Walla Walla River tributary) (Corps of Engineers dam)
South Fork John Day River (waterfall, river mile 29)
Yellowhawk Creek (Walla Walla River tributary) (two dams)
West Fork Hood River (cascades, river mile 6)
Big White Salmon River (Condit Dam)

Upstream and downstream fish passage at many dams in the subregion is presently infeasible because of technological and economic

problems. Future research may suggest feasible means to achieve passage and, in this event, the following sites would be indicated for construction of fish passage facilities between 1981 and 2000: Pelton, Round Butte, Prineville, Ochoco, and McKay Dams.

Fish passage is provided at Pelton and Round Butte Dams. However, passage of juvenile fish through the reservoirs has not proved successful. New methods of providing downstream passage need to be developed.

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 58.

Greater Harvest

There is little opportunity for increasing the subregional harvest of anadromous fish. However, cycling pumps, to withdraw and discharge water, could be located in various areas of mainstem reservoirs to attract and hold fish to make them more available to fishermen. Resident salmonids are underharvested in a few isolated areas. Some populations can not stand a significant increase in fisherman-use without seriously affecting the quality of fishing. Warmwater fish are underharvested and could stand increased fishing pressure without a substantial increase in fish populations. Their needs will be satisfied through year 2020 provided the present level of management continues.

Augmentation of Supply

Future salmonid populations will be more dependent upon hatcheries and other means of artificial production, as wild stocks will not be able to keep pace with demands. Increased hatchery production can be accomplished through water reuse, controlled environment, improved feeds, disease abatement, and other techniques. Expansion of hatcheries and construction of new hatcheries will be necessary to meet future demands. Hatchery capacities have not been determined.

New hatcheries are being considered by State agencies at the following sites:

Pelton Dam
Squaw Creek (Deschutes River tributary)
Crooked River Springs (river mile 12)

Other sites could be identified with more detailed investigations.

Table 58 - Fish Habitat Improvement Means, Subregion 7

Federal

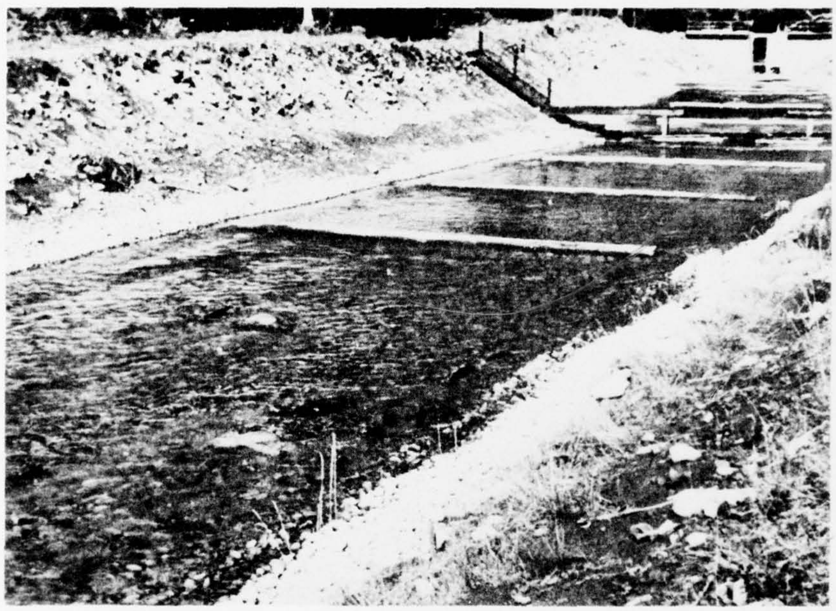
Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Stream improvement	mile	180	360	240	480	210	420
Stream channel preparation	mile	1	--	2	--	2	--
Lake improvement	acre	3,150	2,363	4,200	3,150	4,060	3,045
Sub-totals			2,723		3,630		3,465
Planning							
Fish stream surveys	mile	1,040	32	Not available		Not available	
Fish lake surveys	acre	13,500	108	Not available		Not available	
Sub-total			140				
Total			2,863				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement							
Stream	mile	537)	4,470	1,290)	5,470	2,020)	6,200
Lake	acre	9,490)		28,200)		42,360)	
Fish lakes	acre	2,085	2,530	4,025	4,840	4,025	4,840
Totals			7,000		10,310		11,040

Rearing of anadromous fish in impoundments has been moderately successful. Impoundment sites for this purpose should be located and reserved for fish production by 1980.

In the past, much fish habitat has been lost to various decimating factors; however, there is a potential for rehabilitating and enhancing the remaining environment. With intensive management and application of new techniques, the freeflowing portions of the rivers can become high fish producers, which will satisfy a significant portion of the future needs. It will not be possible to satisfy future needs by natural reproduction alone. The remaining needs can be fulfilled by artificial propagation to augment the natural supply. Expansion and remodeling of the existing hatcheries and use of small impoundments and spawning channels will aid in meeting future needs.



Fish stocks may be increased through spawning channel development. (Bureau of Commercial Fisheries)

Hunting

Subregion 7 will need to supply an additional 1.2 million hunter-days annually by 2020. The key to providing future wildlife oriented recreation rests heavily upon preservation of habitat to produce animals, to provide a base for intensive management activities, and to furnish a place for the public to participate. Detailed studies will be needed to develop a master plan for satisfying future needs.

Nonhunting use of wildlife is expected to increase many times by 2020. No specific programs are proposed here, but they are needed for this purpose. Measures designed to satisfy hunting needs and protect rare and endangered species will not do enough to provide these needs. It is important that water and recreation development plans be studied for opportunities to provide nonhunting activities, especially near urban centers and along travel routes.

Habitat Preservation

Preservation of the deer and elk winter ranges is a high priority measure essential to satisfying future hunting needs. These areas vary in characteristics including elevation which is generally below 2,000 feet in Klickitat County and generally below 3,500 feet in the Blue Mountains. Detailed studies are needed to determine land ownerships and measures needed to prevent loss or deterioration of key winter areas. Principal measures to be taken include fencing, land acquisition, and revised land use practices.

The following big game areas should be preserved for existing and potential values:

Touchet River - South Fork, North Fork, and Wolf Fork - from national forest boundary to Dayton (preserve canyons)
All principal Blue Mountain canyons - from national forest lands to approximately 1,800 feet in elevation
Rock Creek Canyon - (Klickitat County) from Box Canyon to mouth (Klickitat) including parts of Squaw Creek drainage
Little Klickitat Canyon - from High Prairie to mouth
Major Creek Canyon - from Mountain Brook School and Snowden vicinity to mouth
Klickitat River Canyon - from Yakima Indian Reservation to mouth
White Salmon River Canyon - from Trout Lake to mouth
Little White Salmon Canyon - from Willard to mouth
Wind River Canyon - from Tyee Hatchery to mouth

Huntable populations of upland game and waterfowl will be more and more restricted to public lands as private lands are developed. It will become increasingly important that permits for other uses on public lands be issued only when there will be no adverse impact on wildlife. Much upland game hunting occurs on private land, and landowners should be encouraged to protect and develop wildlife habitat through economic and other considerations.

Protection of habitat corridors (edge) along all watercourses would provide wildlife with sustaining environment. All forms of

wildlife would benefit from these permanently zoned riparian lands, and wildlife-oriented recreation would also derive direct benefits from seasonal access.

Zoning is a necessary means to protect and enhance the habitat essential to continued wildlife production and hunting. A zoning plan should be employed to prevent construction of homes, industries, and recreational developments in key areas or to regulate such activities as fishing and boating where they conflict with waterfowl production or hunting.

Certain portions of Subregion 7 are of special significance to a variety of wildlife and will play a key role in providing increased hunting and nonhunting activities in the future if they are protected. The following areas are of major importance and their wildlife environment should be preserved for existing and potential values:

John Day River Canyon - from Dayville to mouth
Deschutes River Canyon - from Sherars Bridge to mouth
Touchet River - from Dayton to mouth
Mineral Springs (Klickitat County) - for band-tailed pigeon
Swale Creek - all
Little Klickitat River - from Goldendale to Blockhouse Creek

Following is a list of wetland and water areas, totaling about 50,000 acres, of value to waterfowl and other water-oriented birds and mammals. Some of these locations are important hunting sites. These areas should be given high priority for preservation and study in any far-reaching plan to maintain and improve wetland environment and wildlife resources thereof.

Columbia River:
Columbia River bottomlands - from Stevenson, Washington, and Cascade Locks, Oregon, upstream to Snake River

Walla Walla River Basin
Walla Walla River bottomlands - from Wallula upstream into Columbia County, Washington

Umatilla River Basin
Bottomlands - from mouth to Echo, Oregon
Meadows - between Emigrant Buttes and Stanfield, Oregon
Pine Creek Meadows - near Milton-Freewater, Oregon
Pine Creek Meadows - near Ukiah, Oregon
Snipe Creek - meadows near Ukiah, Oregon

John Day River Basin
  All bottomlands
  Hay Creek - bottomlands near mouth

Deschutes River Basin
  Deschutes River bottomlands - from Pringle Falls downstream to Dillon Falls
  Little Deschutes River bottomlands - from mouth upstream to Paulina Prairie
  Marsh along Refrigerator and Marsh Creeks
  Marsh along Swamp and Hemlock Creeks
  South Fork Crooked River bottomlands - upper 6 miles
  Mud Lake and perimeter lands
  Sparks Lake and perimeter lands
  Devils Lake and perimeter lands
  Swampy Lake and perimeter lands
  Davis Lake and perimeter lands
  Huston Lake and perimeter lands
  Ochoco Reservoir and perimeter lands
  Crane Prairie Reservoir and perimeter lands

Hood River Basin
  Lost Lake and perimeter lands

Klickitat River Basin
  Conboy Lake

Habitat Improvement

Habitat improvement is important on key low elevation lands with high wildlife potential based on fertility, temperate climate, and water. These lands are avidly competed for, or are already being utilized to the exclusion of wildlife. This habitat is generally riparian and a necessary requirement of most wildlife.

Lack of water is a principal limiting factor in much of this subregion, and various watershed management techniques and water retention devices such as guzzlers and sumps offer significant opportunities for increasing the carrying capacity of wildlife habitat.

Wildlife habitat can be improved by reducing domestic livestock grazing competition on key areas, by improving livestock forage on lands not significant for wildlife habitat, and by developing more watering areas to produce better distribution of grazing pressure.

Another major opportunity for improvement is revegetating key wildlife areas with forage and cover species preferred by wildlife, including the use of irrigation where necessary. Some arid,

treeless range would support more wildlife with addition of irrigated tree groves for cover. Publicly financed irrigation projects or private irrigation projects on Federal lands should provide not only compensation for wildlife habitat losses, but also enhancement of habitat for upland game, big game, fur animals, waterfowl, and other wildlife on lands retained in public ownership. Enhancement could be attained by designating 5 to 10 percent of lands in such project areas to be held permanently in public ownership and improved specifically for wildlife purposes. Before the year 2020, it probably will be necessary to irrigate much of this reserved area in order to increase wildlife food and cover sufficiently to meet the needs.

A number of lakes, reservoirs, and marshes offer opportunities to increase waterfowl hunting by means of habitat improvement. This could include removal of carp which compete directly for duck food or reduce food production by increasing water turbidity. In some instances, stabilized water levels would be needed to encourage growth of desirable aquatic vegetation. Diking could be employed to isolate small bays and arms of irrigation reservoirs and thereby retain water in these areas following drawdown. Water might also be diverted into diked areas following the irrigation season. Measures of this type would help disperse waterfowl to more hunting areas and in some cases, contribute to increased waterfowl production. Detailed studies will be needed to determine specific projects, costs, and associated benefits, but the following areas offer definite opportunities for waterfowl hunting development and side benefits for use of other wildlife species:

Wickiup Reservoir
Davis Lake
Crane Prairie Reservoir
Prineville Reservoir
Miller Island in Columbia River
Walla Walla River from Touchet River to mouth

Preliminary estimates by the Oregon State Game Commission indicate a need for habitat improvement measures involving 650 miles of fencing, 250,000 acres of habitat manipulation, improved (assured) access to several hundred thousand acres of hunting area, acquisition of 172,000 acres of wildlife lands, and 1,200 waterholes. Similar measures are needed in the Washington portion of the subregion.

Some of the land involved in habitat improvement programs may require irrigation to obtain optimum production. Detailed studies will need to be made before specific locations, costs, and benefits can be assigned to any habitat improvement measures.

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are included in table 59.

Greater Harvest

Mule deer and dryland-associated upland game such as chukar and quail can provide additional hunting at present population levels. Special hunting regulations will probably be necessary to obtain optimum use and harvest in some areas. Improved access to some public and private lands may be required in areas such as John Day and Deschutes Canyons to obtain maximum use. However, such access provisions should be carefully studied. Access and accompanying developments are believed to have reduced elk harvests and populations in areas of the Blue Mountains through harassment. Most so-called inaccessible wildlife populations in Washington are being cropped at rates comparable to accessible populations. A rather unique opportunity for increasing harvests of lesser Canada goose exists in the Horse Heaven Hills of Washington. Greater harvest could be achieved on underharvested populations by acquiring hunter access in this vast wheatland area.

Augmentation of Supply

There is a definite opportunity to provide hunting by means of artificial propagation and stocking of upland game such as pheasant. Expansion of this program could include increased production at the game farm in the Washington portion of the subregion and similar increases in production in Oregon, possibly by constructing an additional game farm in Subregion 7.

Transplanting native or exotic species into new areas deserves continued study. This program may be of great significance in re-establishing populations of native animals in habitat improvement areas.

Artificial feeding, although not yet widely accepted, will likely be required to supply needed nutrition for big game where natural foods become insufficient. Extensive studies are needed to determine the ultimate potential of such a program.

Table 59 - Wildlife Habitat Improvement Means, Subregion 7

Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Seeding and planting	acre	20,600	2,060	26,500	2,650	26,360	2,636
Forage release & prescribed burning	acre	4,600	115	6,000	150	5,900	148
Key area fencing	mile	70	70	100	100	100	100
Permanent openings	acre	1,460	146	1,890	189	1,880	188
Wildlife food crops	acre	3,500	--	5,000	--	3,800	--
Guzzlers	each	50	50	80	80	70	70
Shallow impoundments and marsh improvements	acre	210	158	280	210	270	203
Develop potholes	each	10	5	10	5	10	5
Develop nesting facilities	each	220	11	300	15	300	15
Sub-totals			2,615		3,399		3,365
Planning							
Big game range analysis	acre	3,500,000	350	Not available		Not available	
Upland game habitat surveys	acre	2,300,000	115	Not available		Not available	
Habitat management plans	each	150	75	Not available		Not available	
Sub-total			540				
Total			3,155				

Non-Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement 1/	acre	186,000	519	318,000	2,756	389,000	835
Land acquisition 2/	acre	177,000	5,423	161,000	8,271	157,000	6,106
Fencing 3/	mile	184	153	200	212	327	346
Water developments 4/	each	470	304	668	269	312	70
Totals			6,399		11,508		7,357

1/ Includes cover plots, food patches, marsh development, nest structures, etc.
2/ Obtained by fee purchase and easement rights.
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land, and to protect key wildlife habitat.
4/ Consists primarily of guzzler installations and spring development (including fencing)

LOCATION MAP

SUBREGION 8

S U B R E G I O N 8, L O W E R C O L U M B I A

GENERAL DESCRIPTION OF SUBREGION

The Lower Columbia Subregion consists of about 4,840 square miles in Washington and 260 square miles in Oregon. This includes drainage areas of all Washington streams tributary to the Columbia River between Bonneville Dam and Grays Bay near the mouth of the Columbia, and the Clatskanie River and Tide Creek drainages of Oregon. The principal streams on the Washington side are Cowlitz, Kalama, Lewis, and Washougal Rivers, and on the Oregon side, the Clatskanie.

The area contains few mountain lakes, but there are numerous shallow sloughs, lakes, and ponds in the lowlands along the Columbia River.

Much of the subregion is mountainous. Elevations range from less than 10 feet m.s.l. along the Columbia River to 9,677 atop Mount St. Helens.

The climate is subhumid. Precipitation ranges from about 35 inches near the Columbia to over 100 inches in the mountainous areas.

Eighty-three percent of the watershed is forest land. Much of the land outside national forest boundaries has been logged or burned, and is in second growth and brush. Much of the lowland has been cleared and is used for agriculture, but patches of second growth timber and brush are scattered through even the most intensively farmed areas.

There are two relatively large reservoirs operated for hydropower on Cowlitz River and three on Lewis River. These are the major water development projects, but lower reaches of most of the streams, and the Columbia River, have been channeled and diked. A number of the shallow lakes and sloughs have been drained for agriculture.

The 1965 population of the subregion was 240,100 persons. Most of this population reside in the lowlands near Columbia River, and in the valleys of larger tributaries.

HISTORY OF FISH AND WILDLIFE

Before white settlement, the lower Columbia supported a large Indian population sustained by hunting and fishing and by trading dried fish to less fortunately situated tribes. Principal fish and wildlife harvested were salmon, eulachon, sturgeon, and waterfowl. Big game were not particularly common in the area. Fur animals were numerous at this time, but populations declined rapidly after the establishment of the fur posts beginning with Astoria in 1811. After the great decrease in Indian population about the first third of the century, the Columbia and its tributary streams probably sustained the largest runs of fish since the arrival of primitive man. There were no dams or pollutants, and only enough fish were harvested to supply the small human population of the area and the few primitive salt works where salmon were pickled for export to Hawaii, England, and the east coast.

The establishment of fish canneries (the first cannery in the Northwest was constructed in the subregion in 1866) resulted in a rapid increase in the salmon harvest which reached its peak, for the more desirable species, before the end of the century. Lumbering became an important industry along the Lower Columbia at about the same time salmon harvest reached its peak. Early logging and log transportation methods undoubtedly had serious adverse effects on fish runs. Streams were blocked with dams and debris, spawning gravel was scoured out or silted in, and mill wastes polluted streams. More recently a few hydropower dams have been constructed in tributary streams, and pollution from industries, shipping, and domestic sewage has lowered the quality of fish habitat at some locations.

Big game increased in the subregion with large-scale lumbering, but have declined to some extent in recent years because forests have regrown. Grouse also increased with lumbering. Ring-necked pheasant and valley quail were introduced at about the turn of the century; cottontail were introduced in 1933. Large numbers of waterfowl were present throughout the historical period, but have declined since the early years of this century because of agricultural drainage, changes in farming practices, and other factors.

Laws were passed as early as 1876 to protect fish and wildlife. The first active management of these resources occurred in the late 1800's and early 1900's with the establishment of bag limits, season closures, licenses, and refuges, and the appointment of management personnel. Early management activities successfully reduced the overharvest of some fish and wildlife and permitted some species to increase in numbers. However, the human population increased substantially and the development of cities, farms, and

industries became more and more extensive. Water pollution, land clearing and drainage, dredging, spoil disposal, and many other activities drastically altered the fish and wildlife habitat. These factors have continued at an accelerated rate and have reduced the quality and quantity of habitat for some species over much of the study area.

PRESENT STATUS

The subregion supports anadromous and resident game fish, big game, upland game, fur animals, waterfowl, and many species of other wildlife.

Expenditures associated with recreational use of fish and wildlife within the subregion amount to about $6,300,000 annually. These activities provided about 1,081,000 man-days of fishing and hunting in 1965.

Many factors affect the fish and wildlife resources of the subregion, but most pronounced are activities that alter their habitat. Figure 33 shows facilities that have been established to conserve habitat and to help maintain the fish and wildlife resources.

Anadromous Fish

Anadromous fish are produced in the Lower Columbia Subregion; however, most of this production is harvested in other areas. Because of the widely dispersed harvest of subregion stocks of fish, a regional analysis of the present status is presented in the "Regional Summary."

Resident Fish

Resident game fish include rainbow, cutthroat, and brook trout, Dolly Varden, mountain whitefish, kokanee, coho salmon, bass, bluegill, crappie, and catfish. Sucker, carp, squawfish, sculpin, dace, shiner, chub, and many other nongame fish are abundant in streams, lakes, and reservoirs.

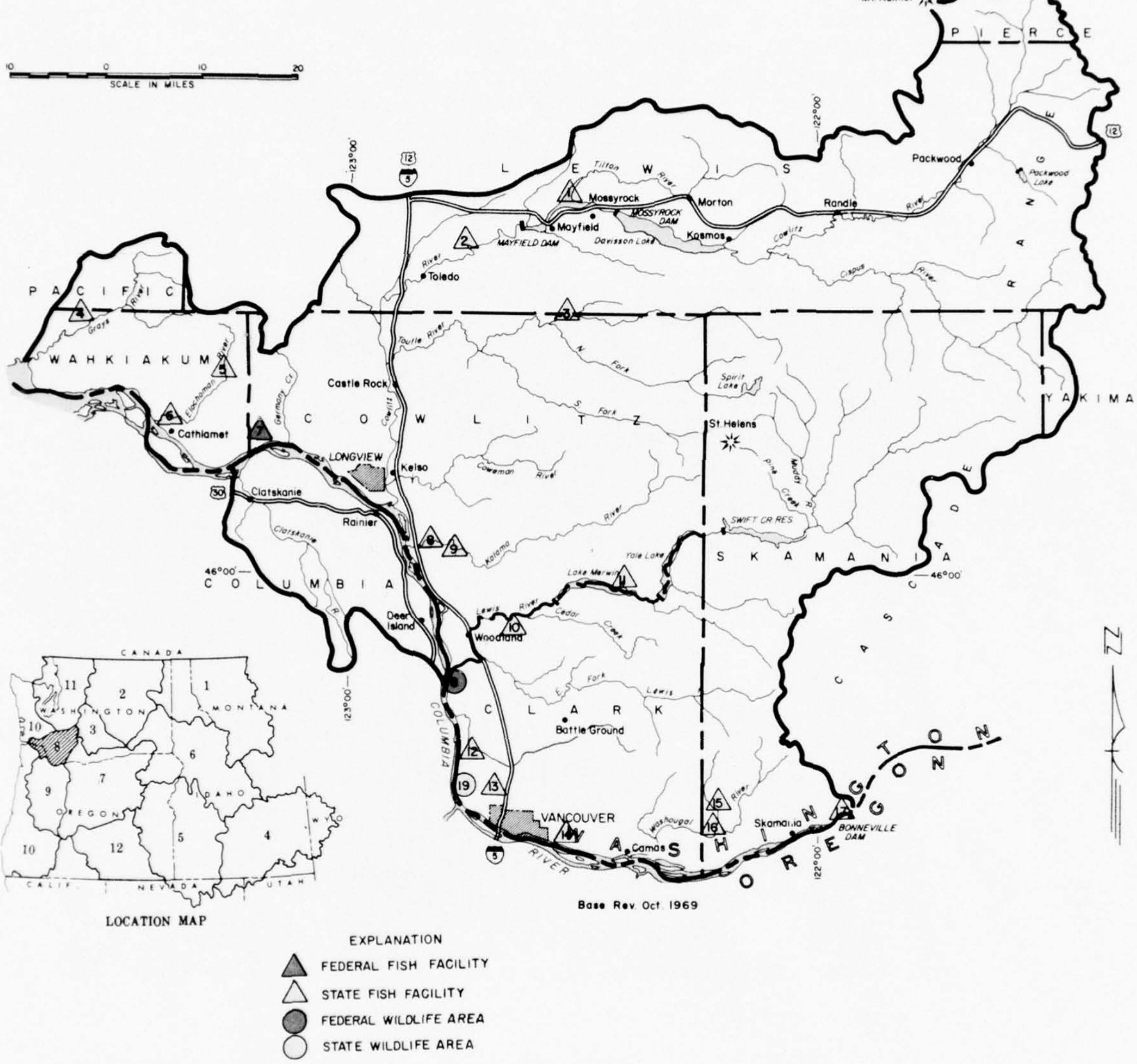
Habitat

The area is well supplied with streams, most of which support resident trout populations in their upper reaches. A number of streams at lower elevations are regularly stocked with legal-sized fish. A few relatively high-elevation lakes--Packwood and Spirit Lakes in the Cowlitz River drainage, Merrill Lake in the Lewis River drainage, and other smaller lakes--are good trout producers. Several lowland lakes including Silver Lake, Cowlitz drainage;

FIGURE 33. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965	
		Acres	Pounds
1	Mossyrock Hatchery		42,293
2	Blue Creek Slough Rearing Area	15	107,300 1/
3	Toutle State Salmon Hatchery		66,203
4	Grays River State Salmon Hatchery		46,786
5	Elokomin State Salmon Hatchery		62,825
6	Beaver Creek Hatchery		99,030
7	Salmon Cultural Laboratory		11,229
8	Lower Kalama State Salmon Hatchery		20,630
9	Kalama Falls State Salmon Hatchery		90,515
10	Lewis River State Salmon Hatchery		30,690
11	Speelyai State Salmon Hatchery		24,713
12	Salmon Creek Rearing Area	6	24,600 1/
13	Old Vancouver Hatchery 2/		
14	Vancouver Hatchery		79,252
15	Washougal Salmon Hatchery		90,279
16	Skamania Hatchery		103,140
17	Greenleaf Slough Rearing Area	51	107,509 1/
18	Ridgefield National Wildlife Refuge	2,483	
19	Shillapoo Wildlife-Recreation Area	483	

1/ Numbers of fish.
2/ Administrative facility only.



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

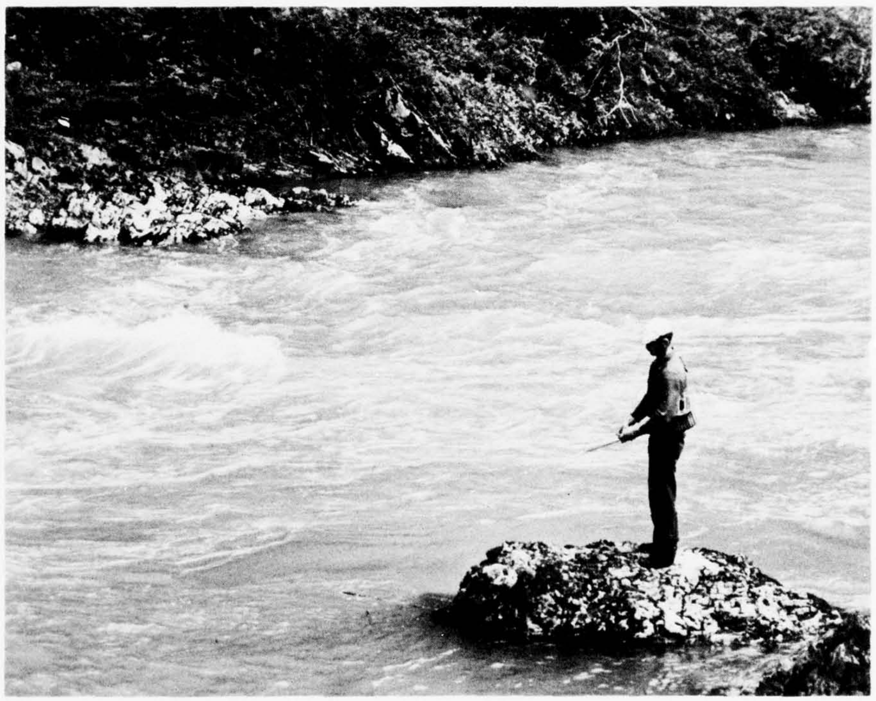
LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

LOWER COLUMBIA SUBREGION 8

1970

FIGURE 33

Horseshoe Lake, near Woodland; Battleground Lake, near Battleground; and Lacamas Lake, near Camas are regularly stocked with legal-sized trout and in some cases populations overwinter. The Lewis River reservoirs furnish good trout habitat; but only Swift Creek Reservoir, the uppermost of the three, has been stocked in recent years because of nongame fish competition in the lower reservoirs. Silver Lake and Lacamas Lake are well known producers of bass and panfish. The lower reaches of some of the major Columbia River tributaries and many lakes and sloughs along the Columbia are also good warmwater fish habitat. About 70 farm ponds are managed for fish production.



Subregion streams attract trout fishermen. (Washington Department of Game)

Nongame fish are also abundant in lower elevation waters. Squawfish are particularly abundant in reservoirs where favorable environment for nongame species was created by dam construction.

Use

Angling for resident fish is a major recreation activity in the subregion. Approximately 679,000 angler-days are spent annually as shown in table 60.

Table 60 - Estimated Sport Fishing Use of Resident Fish, Subregion 8, 1965 1/

Waters	Angler-Days Oregon	Angler-Days Washington	Totals
Streams	1,300	184,678	185,978
Lakes, Ponds, Reservoirs	--	493,342	493,342
Totals	1,300	678,020	679,320

1/ Estimates based on data obtained from fish and game agencies of respective States.

There is heavy fishing pressure on resident salmonids and the more accessible areas require stocking with artificially propagated fish.

Since major metropolitan areas of Oregon and Washington are near, many people make weekend trips into the subregion. Annual expenditures for tackle, gear, travel, and lodging amount to about $3,400,000.

Many unstocked waters support trout populations, but generally not in numbers capable of supporting a significant increase in fishing pressure. Warmwater game fish are underharvested and could provide a significant increase in angler use.

Factors Affecting Resource

There are four State trout hatcheries and two small privately-owned trout production areas in the subregion. Annual releases of about 13,000 pounds of rainbow and brook trout, kokanee, and coho salmon are made in subregion waters for sport anglers.

Quality of some salmonid habitat has been reduced by dam construction; however, the reservoirs created by these dams have provided water areas for angling from boats and have increased fishing opportunity. With adequate stocking, angler use of reservoir waters is heavy.

Limited access to many streams is a problem which often results in crowding of fishermen. Washington Department of Game has purchased access areas and constructed launching ramps at several locations in the subregion.

Logging practices often create undesirable stream conditions which adversely affect resident fish and angling.

Log jams create numerous fishery management problems. (Oregon State Game Commission)

Where habitat for resident salmonids is optimum, warmwater and nongame fish are rare; however, habitat requirements often overlap, and competition is intense.

Along portions of the Columbia River flood plain, industrial and municipal pollution is near critical levels for salmonids and warmwater game fish. Temperature increases resulting from proposed thermal powerplants could seriously deplete the remaining fish habitat.

Big Game

Black-tailed deer, Roosevelt elk, and black bear are the principal big game of the subregion. Small numbers of mountain lion and mountain goat are also present. The subregion has a relict population of Columbian white-tailed deer along the Columbia River in Wahkiakum County, Washington.

Habitat

Highest quality habitat for deer, elk, and bear is found in logged areas and burns where dense brush and closed-canopy timber

have been removed and forage and browse are most abundant. Such areas support major populations of these animals. Lesser numbers are found in areas of dense timber and brush, steep terrain, and in farm areas. Wintering areas for deer and elk are not exactly defined but are usually located in areas of low snowfall below 2,000 feet elevation.

Use

Hunting effort amounted to about 220,000 man-days in 1965. This use is analyzed in table 61. Much of the bear hunting and harvest is incidental to deer and elk hunting.

Table 61 - Estimated Hunting Use of Big Game, Subregion 8, 1965 1/

Species	Hunter-Days Oregon	Hunter-Days Washington	Hunter-Days Totals
Deer	4,000	131,000	135,000
Elk	--	81,000	81,000
Bear	--	4,000	4,000
Totals	4,000	216,000	220,000

1/ Estimates based on data obtained from fish and game agencies of respective States.

Big game provided about 54 percent of the hunting in the subregion in 1965 and resulted in an estimated total expenditure of more than $2,000,000.

Deer and bear can withstand heavier hunting in some areas, but much of this potential is in areas that are either inaccessible, closed to public access, or extremely difficult to hunt. Elk and mountain lion are hunted to near maximum. Mountain goat hunting is not permitted.

Factors Affecting Resource

Water development projects have influenced big game in a number of ways, but especially through habitat losses in impoundment sites.

Quality of deer and elk habitat has been reduced in some areas where the amount of logging has decreased and improved fire prevention and control methods have been instituted. Urban and industrial expansion, highway construction, and many other activities

have destroyed habitat of value to big game and created additional hazards for these animals.

The principal factors benefiting deer, elk, and bear are logging and wildfire which remove closed-canopy timber and facilitate growth of browse and forage. Big game also benefits from the practice of cutting young regrowth timber for the pulp industry. This activity reduces the time span between cuttings, and is especially beneficial at lower elevations.

Upland Game

Upland game of Lower Columbia Subregion includes ring-necked pheasant, valley and mountain quail, blue, ruffed, and spruce grouse, mourning dove, band-tailed pigeon, cottontail, and snowshoe rabbit.

The cottontail is a major upland game species. Band-tailed pigeon and mourning dove also furnish considerable hunting. Some pheasant are produced, but much of the hunting for this species is supplied by releases of game farm birds.

The cottontail--major upland game species. (Idaho Fish and Game Department)

Habitat

Ring-necked pheasant, valley quail, and mourning dove are present in greatest numbers in grain producing areas adjacent to

brushy fence rows and other cover. Lesser numbers are found throughout the remaining lowland agricultural areas. Cottontail are most abundant in the brushy tracts adjacent to agricultural lands. Ruffed, blue, and spruce grouse, band-tailed pigeon, mountain quail, and snowshoe rabbit are primarily inhabitants of the foothills and mountains.

Use

Hunting effort in 1965 was about 131,000 man-days. An analysis of this use is presented in table 62.

Table 62 - Estimated Hunting Use of Upland Game, Subregion 8, 1965 1/

	Hunter-Days		
Species	Oregon	Washington	Totals
Pheasant	9,000	28,000	37,000
Quail	2,500	500	3,000
Grouse	1,000	52,000	53,000
Mourning Dove	2,000	2,000	4,000
Band-tailed Pigeon	2,500	14,500	17,000
Rabbit	--	17,000	17,000
Totals	17,000	114,000	131,000

1/ Estimates based on data obtained from fish and game agencies of respective States.

Upland game provided about 32 percent of the hunting in the subregion in 1965, and estimated expenditures associated with this hunting amounted to about $600,000.

Factors Affecting Resource

Upland game resources increased with tree clearing and crop planting, and with the introduction of exotic species. Other factors have operated to reduce upland game populations: highway construction, industrial development, urban expansion, clean farming, and indiscriminate use of pesticides and herbicides--each has resulted in loss of habitat or game numbers. Water development projects have had little effect on upland game in this subregion, although some habitat has been destroyed in reservoirs and through stream channel and streambank clearing and wetland drainage.

Management benefiting upland game occurs on one national wildlife refuge and one State wildlife management area. The

Washington and Oregon wildlife agencies conduct habitat development programs that benefit upland game. Several State and Federal agencies encourage and assist landowners to develop food, water, and cover for upland game.

Posting of private lands is common throughout the subregion and seriously reduces hunting opportunity in some areas. Wildlife management agencies are seeking to improve landowner-sportsmen relations and obtain access privileges for the general public.

Fur Animals

Fur animals include beaver, muskrat, mink, marten, river otter, raccoon, bobcat, coyote, fox, opossum, nutria, skunk, weasel, fisher, and lynx.

Habitat

This area is not particularly rich in fur animals. There are beaver, muskrat, mink, and raccoon along the lower reaches of most of the streams and low elevation lakes. River otter occur in the same localities but are not common. The sloughs and shallow lakes along the Columbia are infested with nutria. Opossum have recently invaded Columbia River lowlands and are spreading. Red fox are found in lowlands adjacent to agricultural areas. Coyote are common, particularly in the logged and burned-over areas, and in the scattered timber tracts of the farming areas. Bobcat and weasel range over most of the subregion. Skunk, both spotted and striped, are common except in the high mountains, and may be abundant in some areas. Marten, fisher, and lynx live at high elevations on the west slope of the Cascade Range.

Use

Approximately 6,000 animals were trapped during the 1965-1966 season. Muskrat and beaver pelts made up about 75 percent of the total harvest. The remaining 25 percent were mostly raccoon, mink nutria, and river otter.

Pelts trapped in the subregion during the 1965-1966 season had a value of about $35,000.

Harvest of some species could be greater, but much of the potential consists of low value pelts such as opossum, nutria, and skunk.

Factors Affecting Resource

Water development is usually detrimental to fur animals. Impoundments, drainage, and channeling destroy valuable habitat

that is seldom replaced. Other limiting factors include urban and industrial expansion, landclearing, pollution, and a number of other activities.

Development of waterfowl habitat by State and Federal groups has resulted in incidental benefits to fur animals. Management of the resource is primarily a matter of regulating harvest.

Raw fur price is the major influence on resource use. Trappers usually avoid trapping animals with pelt values that are not commensurate with the effort required to capture them.

Waterfowl

Principal species are mallard, American widgeon, pintail, and green-winged teal ducks, whistling swan, and Canada goose. Waterfowl are primarily migratory inhabitants, although a small number of ducks nest in the subregion, and some are year-round residents.

Habitat

The major waterfowl habitat consists of sloughs, lakes, and farmlands adjacent to the Columbia River. The major concentration area is in Clark County downstream from Vancouver, Washington. Lakes, reservoirs, and streams in the foothills and mountains serve as both resting and nesting habitat for small numbers of ducks, particularly wood duck and merganser.

Use

Hunting use in 1965 was about 47,000 man-days. Table 63 presents an analysis of this use.

Table 63 - Estimated Hunting Use of Waterfowl, Subregion 8, 1965 1/

Waterfowl Group	Hunter-Days Oregon	Hunter-Days Washington	Hunter-Days Totals
Ducks	10,500	29,500	40,000
Geese	6,500	500	7,000
Totals	17,000	30,000	47,000

1/ Estimates based on data obtained from fish and game agencies of respective States.

Waterfowl provided approximately 12 percent of the total hunting in the subregion in 1965, and resulted in expenditures of about $300,000.

The waterfowl resource could not sustain a major increase in harvest.

Factors Affecting Resource

Waterfowl numbers and habitat are affected by a variety of activities that destroy valuable marsh and estuarine areas. Major factors include urban and industrial development, dredging and filling, wetland drainage, diking, revetment, and channeling.

Waterfowl benefit from management of a State waterfowl range and a national wildlife refuge. In addition to waterfowl enhancement and hunting, these two areas also provide public fishing and other outdoor recreation. Other beneficial activities include development and preservation of waterfowl habitat by farmers and private organizations such as gun clubs and conservation clubs.

Refuges provide needed habitat for waterfowl. (Bureau of Sport Fisheries and Wildlife)

Some factors affecting waterfowl hunting are water conditions, weather, and access. Low water levels early in the hunting season often reduce the amount of productive hunting area available.

Weather plays an important role in waterfowl movements, and mild weather commonly delays migration flights from the north and restricts early season hunting. Restricted access to private lands and gun clubs minimizes use of the resource.

Other Wildlife

Lower Columbia Subregion supports many other species of wildlife. Some are important because they conflict with man's interests, are sought by sportsmen, or have a commercial value. Rats, mice, ground squirrels, moles, starlings, and blackbirds destroy footstuffs or interfere with agriculture. Feral pigeon and a number of other species are hunted for recreation. Many songbirds and waterbirds of esthetic importance are present and provide recreation for many people. Small numbers of bald eagle are present.

Virtually the entire subregion is inhabited by one or more forms of wildlife of this group. Hunting for unprotected species amounted to about 7,000 man-days or about 2 percent of the hunting in 1965. Hunting could be increased substantially for some species.

The many factors affecting big game, upland game, fur animals, and waterfowl also influence this group.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

Fishing

Resident fish will need to support an additional 952,000 angler-days by year 2020. In addition, the subregion will need to support a significant portion of the regional need for anadromous fish angling and the commercial fishery.

Lower Columbia Subregion probably has a greater potential for supplying the regional need for additional anadromous fish than other Columbia Basin subregions, because it is situated downriver from all the major Columbia River hydropower dams and is relatively close to the ocean.

The subregion has the potential for satisfying all needs for resident fish and a significant portion of the regional needs for anadromous fish. To accomplish this will require an integrated

plan of development and habitat preservation. Defining specific costs and details of an integrated plan will require more detailed study.

Habitat Preservation

Subregion 8 provides some of the region's best anadromous fish angling. It also contains one of the few streams in the region where a significant eulachon fishery occurs--the Cowlitz River, which also ranks among the top ten steelhead streams of the State of Washington. Angling for anadromous fish is dependent upon suitable stream environment. Spawning and rearing of anadromous fish are dependent upon suitable water quality and access to spawning gravel. As much existing stream habitat as possible should be preserved in order to satisfy future anadromous and resident fish angling needs.

The following streams are recommended for preservation in their present state and possible enhancement in the interest of the fish resource:

Kalama River - all
Toutle River - from junction of North and South Forks to mouth
North Fork Toutle River - all
South Fork Toutle River - all
Clatskanie River - all
Big Creek - all
Washougal River - all
Wind River - all
East Fork Lewis River - all

Habitat Improvement

The following lakes and streams need improvement as indicated:

South Prairie Lake - Raise water level 2 to 3 feet
Council Lake - Raise water level 3 feet
Little Fish Lake - Raise water level 3 feet
Steamboat Lake - Replace old outlet dam
Hidden Lake - Construct small dam with outlet
Zig Zag Lake - Construct small dam to increase depth
Mud Lake - Construct outlet dam, rehabilitate 120-140 surface acres
Reber Lake - Divert inlet creek and build additional dikes
Shanghai Creek - Construct dam to form 120-surface-acre fishing lake

Fifth Plain Creek - Construct dam to form 60- to 70-surface-acre fishing lake
Goat Marsh - Construct dam to form 25-surface-acre fishing lake

An increase of 100 cfs in summer flows in Grays, Coweeman, and Washougal Rivers would expand the potential for rearing steelhead migrants and would also be beneficial to sport fishermen.

A few streams in the subregion have natural and manmade barriers to anadromous fish. The streams listed below have potential for increasing fish production with proper fish passage measures:

Fall Creek (Clatskanie River tributary) - Falls near mouth
Tide Creek - 30-foot falls - Passage would make available 7 miles of stream
Beaver Creek - 50-foot falls, 10-foot falls - Passage would make available 20-30 miles of stream
Cowlitz River - New Cowlitz Dam

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 64.

Greater Harvest

Most stocks of salmonid fish are presently used to capacity; however, opportunities for improved access will be needed as the stocks of fish and numbers of fishermen increase. Warmwater game fish could stand additional harvest; however, additional public access will be needed. Also additional water surface and shoreline area could be made available to fishermen if the practice of storing logs in some of the waters is discontinued.

The following lakes and reservoirs have the potential for satisfying future needs if additional public access is provided, or access facilities are improved:

	Surface Acres
Drano Lake	220
Bolles Lake	13
Grant Lake	11
Greenleaf Slough	48
Tunnel Lake	13
Frunz Lake	99
Battleground Lake	28
Dead Lake	16
Yale Lake	3,800
Lake Merwin	1,689
Merrill Lake	344
Davis Lake	19

Table 64 - Fish Habitat Improvement Means, Subregion 8

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Stream improvement	mile	30	60	50	100	40	80
Lake improvement	acre	180	135	250	188	240	180
Sub-totals			195		288		260
Planning							
Fish stream surveys	mile	390	12	Not available		Not available	
Fish lake surveys	acre	2,860	23	Not available		Not available	
Sub-total			35				
Total			230				

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement							
Stream	mi.	145)	2,768	535)	2,259	543)	2,792
Lake	acre	7,413)		11,486)		2,747)	
Fish lakes	acre	439	613	381	498	435	543
Totals			3,381		2,757		3,335

Subregion 8 contains 856 miles of riverbank, excluding the Columbia River, and 276 miles of creeks, outside of federally-owned or -controlled properties. Many of these streams are popular fishing areas but are presently crowded at the few access points. Additional access sites should include pedestrian easements, boat launching sites, and parking areas. Access sites should be located every 3 or 4 miles on each of the larger and more popular streams where drift boats are used for fishing.

Some of the more popular streams and specific recommendations for each are listed below:

Grays River - Construct two boat launching sites, two parking sites
Cowlitz River - Construct boat launching sites every 4 miles along lower 25 miles of river; construct at least 20 parking areas for bank fishermen
Kalama River - Construct one boat launching site 10 miles upstream from Interstate 5; construct 5 parking sites for bank fishermen
Toutle River - Construct 10 parking sites for bank fishermen
North Fork Lewis River - Construct boat launching sites every 4 miles in the lower 16 miles of stream
East Fork Lewis River - Construct boat launching facilities at Lewisville Park and Daybreak Bridge; construct 10 parking sites for bank fishermen
Washougal River - Construct 2 boat launching sites and 10 parking areas for bank fishermen
Wind River - Construct 5 parking sites for bank fishermen

Augmentation of Supply

Subregion 8 has a tremendous potential for increasing salmon and steelhead populations through artificial propagation. There are presently 17 hatcheries producing salmon and steelhead and some have potential for expansion or could be modernized.

Vegetative regrowth in the Clatskanie River watershed has improved water quality resulting in potential for a new hatchery facility. Investigations should be undertaken to examine this potential.

Ponds and lakes which have a potential for rearing anadromous fish are listed below:

Hessler Pond (Salmon Creek near Battle Ground, Washington)
Nichols Pond (Salmon Creek near Battle Ground, Washington)
Strom Ponds (Salmon Creek near Battle Ground, Washington)
Duncan Creek Lake (Columbia River near Skamania, Washington)
Franz Lake (Columbia River near Skamania, Washington)
Nixon Pond (East Fork Lewis River near La Center, Washington)
Carty Lake (Columbia River near Ridgefield, Washington)

These waters require additional study to determine feasibility and methods for rearing anadromous fish.

Most ponds and lakes listed should be examined and rearing programs put into operation by 1980. Construction and modernization of existing hatcheries should be completed by 2000. Increased production from 2000 to 2020 will depend primarily upon improved hatchery techniques and disease abatement.

Additional augmentation will be needed for resident fish, but probably the most significant contribution from Subregion 8 will be to the salmon and steelhead fisheries.

Hunting

Subregion 8 will need to support an additional 481,000 hunter-days by 2020. This goal can be reached only through an extensive program of habitat preservation to maintain present numbers of animals and provide a base for increasing future production through habitat improvement. This program is also needed to assure the public of a place to hunt. Water resource development per se will offer few, if any, opportunities to enhance wildlife populations. Flood control and drainage will contribute to habitat loss by land clearing and more intensive land use and habitation. Impoundments will completely eliminate habitat within the high water line and the value of adjacent habitat will be reduced by construction of roads and recreation facilities.

Habitat Preservation

Two-thirds of the subregion is in private ownership, and any program designed specifically to preserve large amounts of wildlife habitat would require cooperation of many landowners. This is especially true for big game (winter range), waterfowl, and farmland-associated upland game. Any such program would require land acquisition or leasing, and high costs would be a problem.

Numerous opportunities exist for multipurpose planning to provide habitat preservation. Flood plain zoning to protect highly productive lands against wholesale development has long been advocated. This would prevent indiscriminate placement of industrial

sites, highways, and urban areas which have little or no need for rich soil. Once reserved by zoning, these lands could withstand occasional flooding and continue to provide agricultural crops and wildlife, plus open space and numerous recreational uses. This action could help preserve additional habitat by eliminating or minimizing flood control measures in upstream areas. Zoning to preserve wildlife environment could also be used outside flood plain areas to prevent loss of key habitat to highway construction, dredging, land filling, and farming practices.

The Columbia River bottoms in the Cathlamet-Skamokawa area support virtually the entire remaining population of the rare Columbian white-tailed deer. Habitat for this species is gradually being destroyed by expanding agriculture, and protective measures are needed to prevent the loss of the remaining area.

Specific areas that should be preserved for big game, east of the Cowlitz River, include the following major drainages between the national forest boundary and the approximate 800-foot contour:

Cispus River
Salmon Creek
Green River
Kalama River
Washougal River
Hamilton Creek
North Fork Lewis River
Winston Creek
North and South Forks, Toutle River
Coweeman River
Swift Creek
North Fork Washougal River
Rock Creek
East Fork Lewis River

Specific areas that should be preserved for big game west of the Cowlitz River include lands between 200 feet and 2,000 feet elevation in the following major drainages:

Coal Creek
Germany Creek
Skamokawa River
Abernathy Creek
Elokomin River

Following is a list of wetland and water areas of value to waterfowl and other water-oriented birds and mammals. Some of these locations are very productive hunting sites. These areas should be given high priority for preservation and further study in any far-reaching plan to maintain and improve wetland environment and wildlife resources thereof:

Columbia River, small tributaries and islands:
- Bottomlands (Oregon and Washington) from Skamokawa, Washington, upstream to Stevenson, Washington, and Cascade Locks, Oregon, including Lacamas Lake and certain perimeter lands
- Bachelor Island

AD-A036 559 PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6
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Burke Island
Martin Island
Deer Island
Sandy Island
Walker Island
Grims Island
Wallace Island
Puget Island (east end)

Lewis River Basin:
East Fork Lewis River bottomlands - from La Center upstream several miles

Kalama River Basin:
Kalama Pigeon Springs (pigeon area)

Cowlitz River Basin:
Mayfield Reservoir and certain perimeter lands
Mossyrock Reservoir and certain perimeter lands
Silver Lake and certain perimeter lands
Coweeman Mineral Springs (pigeon area)
Swafford Valley and perimeter lands
Soda Springs (pigeon area)

Habitat Improvement

A major problem involving habitat improvement in the subregion is the high percentage of private land. Landowners are understandably reluctant to withdraw land from production. Leases and acquisition of land increase costs substantially. A zoning program as discussed earlier would not only preserve habitat, but would provide areas where habitat improvement could be accomplished.

A principal opportunity for habitat improvement is revegetating wildlife areas with desirable cover and food species. Big game is dependent upon habitat generally below 2,000 feet elevation during the winter, specifically where there is an abundance of low-growing vegetation for food, plus adequate protective cover. This type of habitat is of poorest quality in dense second growth timber, old growth timber, and high brush areas where low vegetation is sparse. Consequently, logging and fire generally create the most productive winter range. Specific measures to increase and improve low elevation deer and elk range could include special programs which would regulate timber harvest to include wildlife needs. Some types of undesirable vegetation could be removed by controlled fire or other measures and benefit not only wildlife but the lumber industry as well.

Farmland-associated upland game rely heavily upon farm crops during the summer and fall, but are dependent upon weeds and shrubs for winter food and cover. This type of habitat has been reduced substantially by clean farming, urbanization, channeling, and related practices. Increasing the amount of this essential habitat adjacent to farm areas could be accomplished on special tracts leased or purchased for this purpose.

Waterfowl habitat improvement will result from increasing the amount of wetland and marsh, and increasing food crops adjacent to good habitat areas. Water areas could be established by constructing low dams to trap water supplied by water development, natural runoff, or irrigation return flows. Irrigation return flows are often polluted. Preventing such water from flowing directly into nearby streams could provide additional wetland and marsh. Food crops and water area could also be provided on publicly-financed project areas. Lands could be acquired by lease or purchase to establish special management areas. Areas with the best acquisition potential and offering the best development opportunities are listed under "Habitat Preservation."

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are included in table 65.

Greater Harvest

Satisfying future hunting needs will create a heavier demand on wildlife populations. Black-tailed deer could withstand greater harvest in some areas; however, extensive studies are needed to determine the amount of hunting and the measures needed to realize this potential. Other wildlife could also provide more hunting in some locations. Improved hunter access and special hunting regulations would be required to realize these potentials.

Augmentation of Supply

Artificial propagation will become more important in future programs to provide additional upland game hunting. Bird farm construction to meet anticipated hunting demands on State-managed lands in the subregion will likely be required by 1980. Introduction of exotic or reintroduction of native wildlife may be used if suitable habitat becomes available.

Table 65 - Wildlife Habitat Improvement Means, Subregion 8

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Seeding and planting	acre	730	73	940	94	940	94
Forage release & prescribed burning	acre	100	3	--	--	--	--
Permanent openings	acre	10	1	--	--	--	--
Guzzlers	each	10	10	--	--	--	--
Shallow impoundments and marsh improvements	acre	30	23	40	30	40	30
Develop nesting facilities	each	20	1	32	2	30	2
Sub-totals			111		126		126
Planning							
Big game range analysis	acre	278,000	28	Not available		Not available	
Upland game habitat surveys	acre	350,000	17	Not available		Not available	
Habitat management plans	each	27	14	Not available		Not available	
Sub-total			59				
Total			170				

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement1/	acre	30,000	2	44,000	3	50,000	3
Land acquisition2/	acre	30,000	11,144	14,000	5,305	21,000	8,062
Fencing3/	mile	32	11	4	5	5	8
Totals			11,157		5,313		8,073

1/ Includes cover plots, food patches, fencing, marsh development, potholes, nest structures, etc., not identified specifically in the table.
2/ Obtained by fee purchase and easement rights.
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land.

LOCATION MAP

SUBREGION 9

S U B R E G I O N 9, W I L L A M E T T E

GENERAL DESCRIPTION OF SUBREGION

The Willamette Subregion is an area of about 12,000 square miles in northwestern Oregon. It is composed primarily of the Willamette River watershed, but includes watersheds of the Sandy River and a few small Columbia River tributaries. The subregion is bordered by the Cascade Range on the east, the Calapooya Mountains on the south, the Coast Range on the west, and the Columbia River on the north. It has a population of 1,339,000 which is about 70 percent of the State's population.

The floor of Willamette Valley is mostly level agricultural land with scattered patches of timber and brush. The foothills and mountains adjacent to the valley are primarily brushland and forest types.

The climate is characterized by dry, moderately warm summers and wet, mild winters. Annual precipitation averages 61 inches, occurring as rain at lower elevations and mostly as snow at higher elevations.

The subregion has a favorable combination of habitat and climate for many species of fish and wildlife.

HISTORY OF FISH AND WILDLIFE

Fish and wildlife resources played a significant role in settlement of the Pacific Northwest. In the early fur trading days, the subregion was considered to be one of the best fur producing areas west of the Rocky Mountains. Exploitation of this resource was largely responsible for exploration and early settlement of the subregion.

Before white settlement there were large Indian fisheries in the lower Willamette, Clackamas, and Sandy Rivers. There were probably few fall chinook upstream from Willamette Falls until recent years; no coho until about 1920; and no steelhead in tributaries upstream from Calapooia River before the early 1950's. During early years of settlement, the subregion's fish resources were little affected by man. Commercial fishing for anadromous fish blossomed in the late 1800's, and the largest Columbia River harvest on record occurred in 1911. Brown and brook trout were introduced to some subregion streams early in the 1900's. Several species of warmwater

fish, including largemouth bass, crappie, yellow perch, sunfish, catfish, and carp were also introduced during the late 1800's and early 1900's.

Native wildlife species were affected by the early activities of man. Some species such as black-tailed deer increased substantially as farming, logging, and fire cleared large areas of dense virgin forest. Roosevelt elk, beaver, river otter, and a number of other wildlife species were drastically reduced by unrestricted hunting, trapping, and habitat destruction. The ring-necked pheasant, bobwhite, and valley quail were introduced in the Willamette Valley in the late 1800's.

Laws regulating management and harvest of fish and wildlife were first enacted in the late 1800's. The early 1900's brought considerable legislative activity in behalf of these resources. A fish hatchery and a number of refuges were established. The first Board of Fish and Game Commissioners was formed, hunting and fishing licenses were required, and some species were given complete protection.

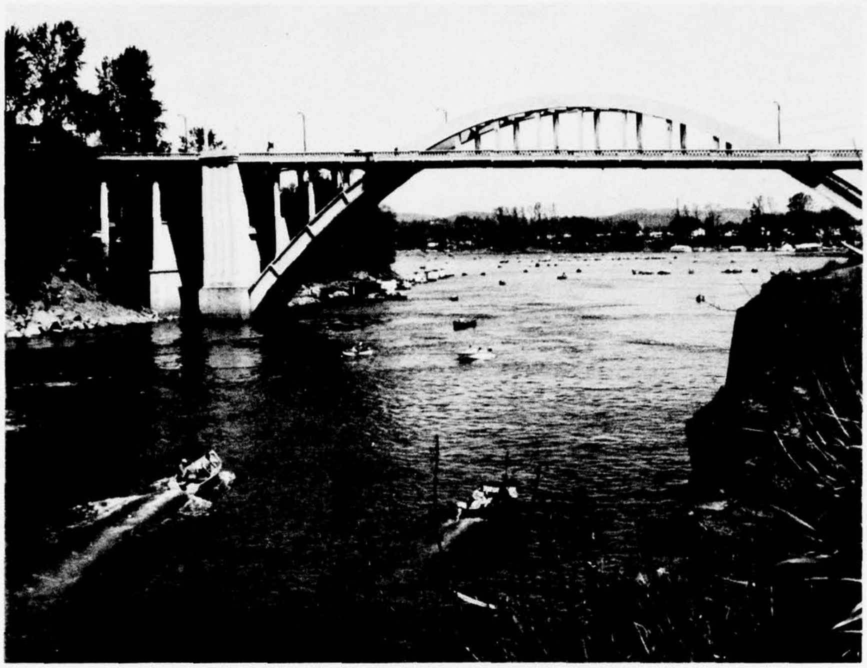
Until the late 1800's man's influence on fish and wildlife was largely a matter of harvest. By the turn of the century, however, habitat destruction and alteration began to remove vital links in the requirements of many species. These activities included land clearing, logging, road construction, water diversion, introduction of pollutants, construction of dams and reservoirs, and urban-industrial expansion with virtually a complete disregard for the fish and wildlife resource. At the same time, increasing human populations created a greater demand for recreational and commercial harvest, but supply of many species was no longer able to satisfy the demands.

Fishery management has increased production of anadromous fish in the subregion in recent years, but resident salmonids have decreased, except in a few reservoirs, as a result of fishing pressure and habitat destruction. Populations of warmwater and nongame fish have increased. Most populations of farmland game peaked prior to 1950. Black-tailed deer peaked between 1955 and 1960. Nearly all these species have since declined in numbers. Elk are expanding their ranges and increasing rapidly. Many species including such undesirables as nutria, opossum, and starling have shown an ability to increase in the face of changing conditions.

PRESENT STATUS

The groups of fish and wildlife are anadromous and resident fish, big game, upland game, furbearers, waterfowl and other

wildlife. These are generally distributed throughout Willamette Subregion. Many species of nongame fish and wildlife are also present.



Significant numbers of salmon are harvested from the Willamette River, near Oregon City. (Fish Commission of Oregon)

Expenditures in 1965 were about $5,000,000 for resident fish angling and about $5,500,000 for hunting. The most significant factors affecting fish and wildlife resources involve man's increasing demands for land and water in the development of a more complex society. Figure 34 shows the fish and wildlife facilities established to mitigate loss of habitat and to maintain fish and wildlife resources.

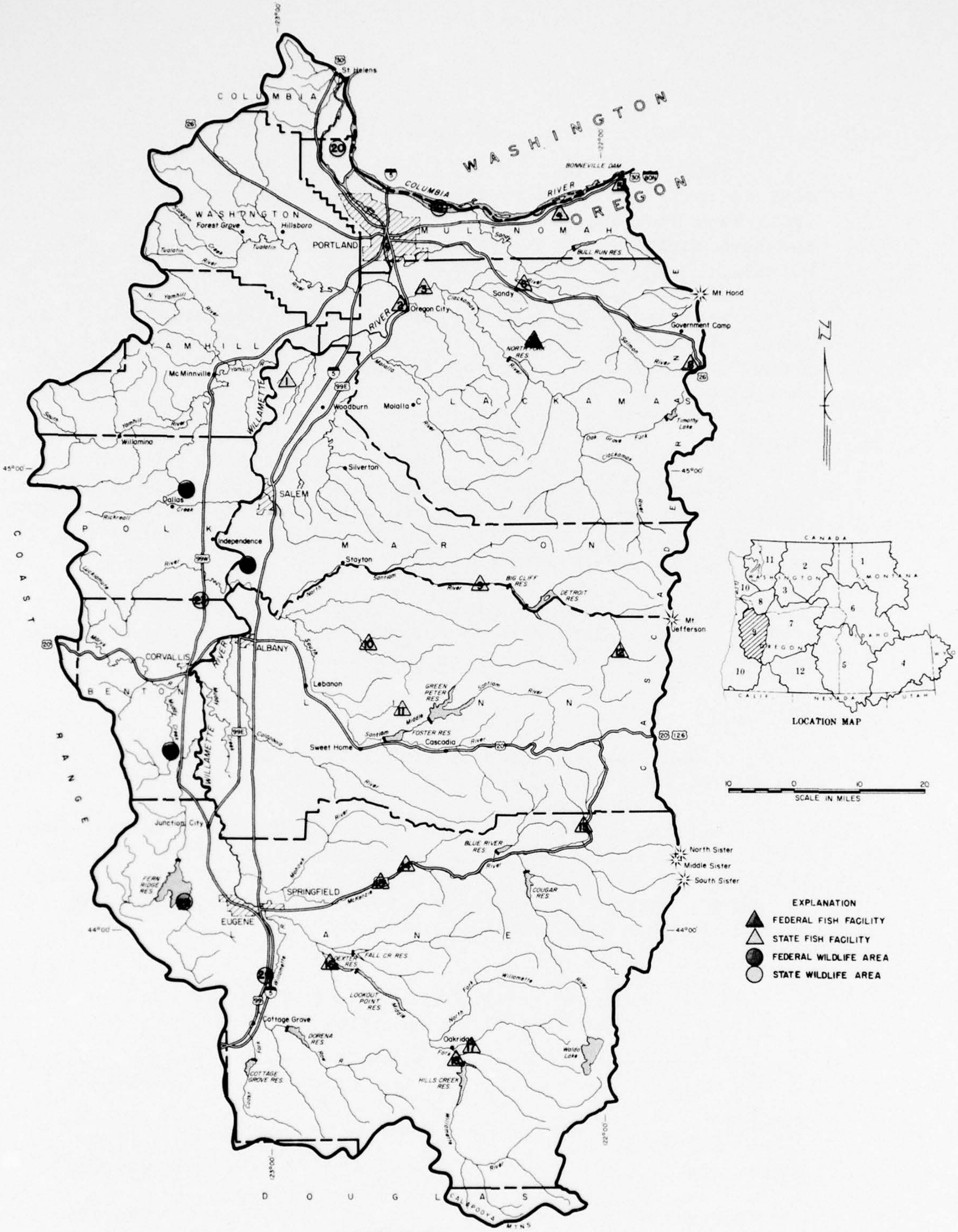
Anadromous Fish

Significant numbers and kinds of anadromous fish are produced in the Willamette Subregion; however, most of the production is harvested outside the subregion. For this reason, a regional analysis of the present status is presented in the "Regional Summary."

FIGURE 34. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	St. Paul Rearing Site	10	
2	Willamette Falls Fishway1/		
3	Clackamas Research Laboratory2/		
4	Waukeena Pond		822
5	Bonneville Fish Hatchery		113,745
6	Sandy River Salmon Hatchery		79,025
7	Eagle Creek National Fish Hatchery		24,351
8	Trillium Lake Fish Management Area	55	
9	Minto Holding Ponds	.25	3/
10	Roaring River Fish Hatchery		88,098
11	South Santiam Salmon Hatchery		8,600
12	Marion Forks Salmon Hatchery		76,963
13	Carmen-Smith Spawning Channel4/		
14	Leaburg Hatchery		202,416
15	McKenzie Salmon Hatchery		27,136
16	Dexter Holding Ponds	0.2	43,253
17	Willamette Salmon Hatchery		106,691
18	Willamette Fish Hatchery		17,213
19	Government Island Game Mgt. Area	2,565	
20	Sauvie Island Game Mgt. Area	12,129	
21	Baskett Slough National Wildlife Refuge	1,801	
22	Ankeny National Wildlife Refuge	1,552	
23	E. E. Wilson Game Mgt. Area	1,625	
24	William L. Finley National Wildlife Refuge	4,329	
25	Fern Ridge Game Management Area	3,972	
26	Camas Swale Game Management Area	2,700	

1/ Fish passage only.
2/ Research only.
3/ Adult holding ponds only.
4/ Experimental facility.



COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

WILLAMETTE SUBREGION 9

1970

FIGURE 34

Resident Fish

Rainbow, cutthroat, and brook trouts are the principal resident salmonid game fish in the subregion. Kokanee and golden trout have been introduced in several areas. Small populations of mountain whitefish, Dolly Varden, and brown trout occur in some waters.

Warmwater game fish include bass, sunfish, crappie, yellow perch, and catfish. Nongame fish are abundant in some areas. These include sucker, carp, squawfish, sculpin, dace, shiner, and many others.

Habitat

Willamette Subregion fishing water is approximately 8,300 miles of streams, 450 natural lakes with about 12,500 surface acres, 22 major reservoirs with about 37,400 surface acres, and 145 farm ponds that have been stocked with fish.

Resident fish are found in all waters of the subregion where suitable habitat exists. Habitat is limited in some areas by low waterflows and excessive pollution.

Use

Angler use for resident fish in 1965 amounted to about 994,000 angler-days. An analysis of this use is shown in table 66.

Angling for resident fish is one of the major recreational outlets for inhabitants of the subregion, as angling waters are within relatively short driving distances from the major metropolitan areas. Estimated 1965 expenditures for tackle, gear, and travel amounted to about $5,000,000.

Table 66 - Estimated Sport Fishing Use of Resident Fish, Subregion 9, 1965[1/]

Waters	Angler-Days
Streams	735,300
Lakes and Ponds	19,900
Reservoirs	238,500
Total	993,700

1/ Estimates based on Oregon State Game Commission data.

Sport fishing for resident salmonids exceeds natural capacity in most accessible areas. Unstocked waters support native fish populations, but generally not in numbers capable of supporting a significant increase in fishing effort. Warmwater fish are under-harvested and could provide for a significant increase in angler use.

Factors Affecting Resource

Four State-operated trout hatcheries support the fishery for resident game fish in the subregion. During 1965, a total of 332,000 pounds of fish was stocked for public fishing. Over 95 percent of the total poundage consisted of rainbow trout. An additional, but unknown, poundage was stocked in private waters and as part of fee-fishing operations in the subregion.

Factors adversely affecting resident fish are the same as those affecting anadromous species, i.e., water pollution, low summer and fall flows, and high water temperatures.

Some reservoirs and streams at lower elevations are infested with nongame fish which reduce quality of fishing. Periodic chemical rehabilitation of infested waters is frequently necessary to reduce these populations.

More water resource developments include protective measures for resident fish than were provided in the past.

Shellfish

Crayfish receive considerable sport fishery use in Willamette Subregion and support a commercial fishery. Estimated 1965 commercial harvest was 18,400 dozen.

Big Game

Black-tailed deer, Roosevelt elk, and black bear are the principal big game. Small numbers of mule deer, white-tailed deer, and mountain lion are also present.

With the general exception of urban and barren alpine areas, the entirc subregion is inhabited by one or more species of big game. The greatest numbers are found in the foothills and mountains adjacent to the valley.

Habitat

Highest quality habitat is found in logged areas and burns where dense closed-canopy timber has been removed and there is abundant regrowth of forage and browse plants. Wintering areas are

not well defined but are usually located below the snowline in stream bottomland of 1,000 to 3,000 feet elevation.

Roosevelt elk--important from a hunting and esthetic standpoint. (Oregon State Game Commission)

Use

Hunting effort in 1965 amounted to about 326,000 man-days. Table 67 shows an analysis of this use.

Table 67 - Estimated Hunting Use of Big Game, Subregion 9, 1965 1/

Species	Hunter-Days
Deer	310,000
Elk	8,000
Black Bear	6,000
Mountain Lion	2,000
Total	326,000

1/ Estimates based on Oregon State Game Commission data.

Much bear hunting and harvest is incidental to deer and elk hunting. Nearly all hunting pressure is provided by residents of the subregion.

Big game provided about 38 percent of the subregion's hunting in 1965. It is estimated that expenditures associated with this hunting amounted to more than $3,000,000.

Deer and bear could provide an increased harvest, but much of this potential is in areas closed to public entry or in remote inaccessible areas. Elk and mountain lion are hunted to near maximum.

Factors Affecting Resource

Most water development projects have had little effect on big game. However, total habitat losses attributable to completed projects are very significant. Projects under construction are continuing to destroy individual tracts of habitat of value to big game, especially deer and elk.

The principal activity benefiting big game is timber harvesting, which removes closed-canopy timber and facilitates growth of browse and forage. Benefits derived are generally incidental to such harvest, but have been reduced in recent years as forestry practices in some areas have changed from large- to small-block cutting. These small tracts do not facilitate growth of enough forage and browse to sustain large numbers of animals. The absence of large fires, such as the Tillamook Burn, has also limited habitat development. Urban and industrial expansion, highway construction, water development programs, and many other activities have destroyed habitat of value to big game.

Hunter use and success is affected by a number of factors, particularly weather and access. Hot, dry weather may cause season closures because of fire hazards. This condition also contributes to retention of plant foliage and seriously hampers hunter vision. Restricted access on some municipal watersheds and private lands prevents hunter use; however, several large privately-owned timber tracts and tree farms are open to hunters.

Upland Game

Principal upland game of Willamette Subregion are ring-necked pheasant, valley and mountain quails, blue and ruffed grouse, mourning dove, and band-tailed pigeon. Bobwhite, snowshoe rabbit, brush rabbit, and silver gray squirrel are also present. One or more species of upland game can be found practically anywhere in the subregion.

Habitat

Distribution of upland game is related directly to habitat. Ring-necked pheasant, bobwhite, valley quail, and mourning dove are present in greatest numbers in grain production areas adjacent to brushy cover. Lesser numbers are found throughout the remaining lowland agriculture areas. Ruffed and blue grouse, band-tailed pigeon, and mountain quail are primarily inhabitants of the foothills and mountains.

Use

Hunting effort in 1965 was about 337,000 man-days. Table 68 presents an analysis of this use. Most of the hunting pressure is provided by inhabitants of the subregion.

Table 68 - Estimated Hunting Use of Upland Game, Subregion 9, 1965 1/

Species	Hunter-Days
Pheasant	182,500
Quail	55,000
Grouse	16,600
Mourning Dove	35,600
Band-tailed Pigeon	25,900
Rabbit	15,000
Squirrel	6,400
Total	337,000

1/ Estimates based on Oregon State Game Commission data.

Upland game provided about 37 percent of the subregion's hunting in 1965. It is estimated that more than $1,500,000 was spent by persons hunting upland game.

Upland game is hunted to near maximum on accessible areas. However, dense cover and inaccessibility prevent harvest of surplus game in some portions of the subregion.

Factors Affecting Resource

Water development has had varied effects on upland game. Impoundments and streambank clearance have destroyed considerable habitat. Flood control and drainage have made it possible to convert tracts of uncultivated lands into homesites or crop production

with a resultant loss of habitat. Irrigation has increased specialty crops and pasture in some grain production areas and reduced the amount of food available for upland game.

Pheasant hunting is an exciting and rewarding sport. (Oregon State Game Commission)

Many activities, including highway construction, industrial development, and urban expansion have permanently replaced large areas of habitat. Field burning, indiscriminate use of pesticides and herbicides, clean farming, and land clearing have reduced food, cover, and game numbers.

Management activities benefiting upland game are conducted on three national wildlife refuges and five State wildlife management areas in the subregion. In addition, Oregon State Game Commission operates a game farm and has an active habitat development program in the agricultural area of the valley. Some landowners have personal interests in upland game and leave scattered patches of food and cover on their lands for wildlife use. Several State and Federal agencies encourage and assist landowners in developing food, water, and cover for upland game and other wildlife.

The major factor affecting hunter use is access. Posting and leasing of hunting rights on private lands are common throughout the subregion and seriously reduce hunting opportunity for upland

game in some areas. Oregon State Game Commission is constantly seeking to improve landowner-sportsman relations and obtain access privileges for the general public.

Fur Animals

Principal fur animals are beaver, muskrat, mink, and river otter. Species of less importance include fox, opossum, skunk, weasel, raccoon, coyote, nutria, bobcat, and marten. Fur animals are found throughout the subregion.

Habitat

Fur animal distribution is basically oriented with three habitat types: water areas, valley lands, and foothills and mountains. Beaver, muskrat, mink, raccoon, and river otter occur around water throughout the subregion. Red fox, opossum, and skunk inhabit lowland areas. Bobcat and coyote are inhabitants of foothill and mountain areas. Marten are found at high elevations along the Cascade crest.

Use

Approximately 12,000 animals were trapped during the 1965-66 season, and muskrat and beaver pelts made up about 70 percent of the total harvest. The remaining 30 percent was mostly nutria, raccoon, mink, and opossum. Harvest of some species could be greater, but much of the potential consists of low value pelts such as opossum and skunk.

Pelts trapped in the subregion during the 1965-66 season had a value of more than $60,000.

Factors Affecting Resource

Water development is usually detrimental to fur animals. Impoundments, drainage, and channeling destroy valuable habitat that is seldom replaced. Other limiting factors include water pollution and urban and industrial expansion. Nutria are serious competitors with muskrat and beaver in some areas.

Pollution control could improve habitat for some fur animals, especially beaver. A variety of mill and farm ponds have also been beneficial. Development of waterfowl habitat by State, Federal, and some private groups has resulted in incidental but important benefits to fur animals.

Resource use is influenced primarily by fur values, and most trappers avoid trapping animals which have a low value.

Waterfowl

Principal waterfowl species are mallard, American widgeon, pintail, green-winged teal, whistling swan, and several races of Canada geese. Waterfowl are primarily migratory visitors during their spring and fall flights to and from northern nesting areas. However, a significant number of birds winter in the area, the most prominent being the dusky Canada goose. A small number of ducks are year-round residents.

Habitat

The major waterfowl habitat area consists of the waters and adjacent farmlands within the flood plain of the Willamette Valley. Ducks are primarily water-oriented and concentrate along rivers, ponds, and sloughs. Canada geese are found in the southern and central portion of the valley in large, grassy fields during the fall and winter. Lakes and reservoirs in the foothills and mountains serve as resting and nesting habitat for small numbers of waterfowl.

Use

Waterfowl hunting use in 1965 was about 111,000 man-days. Table 69 shows an analysis of their use. Most of this use was by residents of the subregion. Waterfowl provided about 13 percent of the subregion's hunting in 1965. Expenditures associated with this hunting are estimated to have been more than $700,000.

Waterfowl hunters are attracted to subregion lowlands. (Oregon State Game Commission)

Table 69 - Estimated Hunting Use of Waterfowl, Subregion 9, 1965 1/

Waterfowl Group	Hunter-Days
Ducks	84,820
Geese	26,398
Total	111,218

1/ Estimates based on Oregon State Game Commission data.

Factors Affecting Resource

Waterfowl are most adversely affected by destruction of wetland habitat. Drainage and filling of ponded areas are of major significance, but reduction of flooding has also reduced the number of temporary and permanent ponds near some major streams. Channeling, revetment work, urban-industrial expansion, and highway construction have also seriously altered much waterfowl habitat. Carp and nutria do considerable damage to waterfowl food plants in some areas.

The Oregon State Game Commission conducts waterfowl management programs on five wildlife management areas, the largest of which is on Sauvie Island at the mouth of Willamette River. The Bureau of Sport Fisheries and Wildlife operates three recently established waterfowl refuges in the subregion. In addition to waterfowl enhancement, these areas also provide hunting, fishing, and other outdoor recreation. Beneficial activities also include development or preservation of waterfowl habitat either intentionally or unintentionally by private organizations such as gun and conservation clubs and by farmers. Fern Ridge Reservoir near Eugene has created fair waterfowl habitat and has considerable expansion potential.

Major factors affecting waterfowl hunting are water conditions, weather, and access. Low water levels early in the hunting season seriously limit the amount of productive hunting area available. This condition is aggravated by flood control and drainage activities in the subregion. Weather plays an important role in waterfowl movements to and within the subregion. Mild weather often delays migration flights from the north and limits early season hunter success. Posting of private lands and leasing of hunting rights limit use of the resource.

Considerable public waterfowl hunting is provided on Oregon State Game Commission's wildlife management areas. No waterfowl hunting was allowed on the national wildlife refuges in 1965, but future management will include this activity following better establishment of the refuges. Public access to rivers, lakes, and impoundments permits hunters to reach many good hunting sites via boat.

Other Wildlife

Willamette Subregion supports many other species of wildlife, some of which are of economic importance in that they are either injurious, or are sought by sportsmen. Among the former are rats, mice, moles, starlings, and blackbirds that destroy foodstuffs or interfere with agriculture. Feral pigeon and crow are hunted for recreation.

The golden-mantled ground squirrel--fascinating forest denizen. (Bureau of Sport Fisheries and Wildlife)

Many rapacious birds including a few bald eagles are found in the Willamette Subregion. Songbirds and waterbirds of esthetic importance are also present and provide recreation for many people.

Virtually the entire subregion is inhabited by one or more species of this group. Hunting for miscellaneous species amounts to about 80,000 man-days annually and could be increased significantly.

The many factors affecting big game, upland game, fur animals, and waterfowl also influence this group. Very few restrictions affect use of most species legally hunted.

About 12 percent of the hunting in the subregion is for animals in this group. Expenditures for hunting are not great, but this group is of considerable recreational value.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

Anticipated urban, industrial, and agricultural expansion will have serious effects on fish and wildlife populations and habitat in Willamette Subregion. The subregion is potentially capable of producing enough fish to satisfy future needs, but much of the need for hunting must be satisfied elsewhere. Accelerated programs of habitat preservation and improvement, artificial propagation, and greater harvest are essential if needs for fishing and hunting are to be satisfied to the maximum feasible extent.

Fishing

Subregion 9 will have to support an additional 1,391,000 angler-days for resident fish by 2020 to satisfy anticipated fishing needs. Substantial increases in anadromous fish will also be required.

Habitat Preservation

Habitat preservation in streams includes maintaining adequate flows, water quality, and pool and riffle relationships to support fishable populations of game fish.

Minimum flows necessary to support fish life have been determined for most streams in the subregion, and have been recommended to Oregon State Water Resources Board by Oregon State Game Commission. These flows are tabulated in the Fish and Wildlife Appendix of Willamette Basin Comprehensive Study main report.

The following are the principal streams that should be preserved in their natural free-flowing state:

Sandy River - from Mt. Hood Wilderness boundary to mouth
Clackamas River - from Oak Grove Fork confluence to mouth
Santiam River - all
  North Santiam River - from Big Cliff Dam to mouth
  Little North Santiam River - from Elkhorn to mouth
  South Santiam River - from Foster Dam to mouth
McKenzie River - all
Willamette River - all
  Middle Fork - from Dexter Dam to mouth
  Coast Fork - from Cottage Grove Dam to mouth
Tualatin River - from Scoggins Creek to mouth
Yamhill River - lower 5 river miles
Pudding River - lower 2 river miles
Marys River - lower 5 river miles

Habitat Improvement

Rainfall in Willamette Subregion is ample during the fall, winter, and spring, but scarce during summer. Streamflows decline in the summer, resulting in higher water temperatures damaging to salmonid fish. Consequently, the most important improvements for stream habitat would involve increased streamflows and decreased water temperatures during the summer and early fall. Improved flows and water quality would result in increased fish resources in virtually every major stream in the subregion. Addendum A of the Fish and Wildlife Appendix, Willamette Basin Comprehensive Study main report, lists optimum flows and estimated benefits for most of the important streams.

Streambed structures such as digger logs, gabions, and sills, or large rocks are needed in several streams to establish the pools and riffles needed for improved fish production. Some structures could result in reestablishing fish populations in stream reaches where fish production has been severely reduced by channeling.

Lakes and reservoirs of the subregion will continue to provide much angling opportunity. Much more angling could be achieved if nongame fish could be controlled in Lookout Point and Dexter Reservoirs.

Several of the reservoirs offer opportunities for rearing juvenile anadromous fish, as well as providing a sport fishery for resident fish. Consequently, there is a great potential for establishing large runs of anadromous fish.

Reservoirs could be operated to produce more fish benefits by reducing the wide water level fluctuations which eliminate fish production in the shallow areas. Realization of these benefits, however, can only be obtained by making fish and wildlife enhancement an authorized project purpose. Proposed operation changes could then be judged in relation to other project functions.

Some falls and cataracts prevent anadromous fish from reaching potential spawning and rearing areas. In almost every instance, adult or fry from fish cultural operations have been released upstream from these barriers. As a result, these stream reaches are producing anadromous fish for sport and commercial fishing. The continued release of hatchery-produced fish in these streams in most instances would be less costly than providing fish passage facilities. Returning adult anadromous fish aid in adequately populating spawning and rearing areas downstream from the barriers.

Upstream and downstream fish passage at many existing dams and natural falls in the subregion is infeasible because of technological and economic problems; however, future research may suggest feasible means to achieve passage. If so, the following sites should be considered for fish passage:

- Coast Fork Willamette River
  - Cottage Grove Dam
- Row River
  - Dorena Dam (and upstream obstructions)
- Middle Fork Willamette system
  - Dexter, Lookout Point, Hills Creek, and Hines Dams (and Salmon Creek Falls)
- South Fork McKenzie River
  - Cougar Dam
- Blue River
  - Blue River Dam
- North Santiam River
  - Big Cliff and Detroit Dams
- Rickreall Creek
  - Dallas Water Supply Dam
- Clackamas River
  - River Mill Dam[1/]
- Bull Run River
  - Bull Run Dams 1 and 2 (and several falls)
- Little Sandy River
  - Little Sandy Dam (and three falls)

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 70.

1/ Fish passage facility inadequate.

Table 70 - Fish Habitat Improvement Means, Subregion 9

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Stream improvement	mile	20	40	30	60	30	60
Spawning bed improvement	mile	40	24	20	30	20	30
Lake improvement	acre	620	465	820	615	800	600
Sub-totals			529		705		690
Planning							
Fish stream surveys	mile	440	14	Not available		Not available	
Fish lake surveys	acre	6,290	50	Not available		Not available	
Sub-total			64				
Total			610				

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement							
Stream	mile	750	8,000	1,000	13,500	750	3,000
Lake	acre	10,000	1,000	10,000	1,000	10,000	1,000
Fish lakes	acre	1,600	2,500	3,200	5,000	3,200	5,000
Totals			11,500		19,500		9,000

Greater Harvest

Anadromous salmonids of the subregion, except winter steelhead trout, are harvested to their maximum. Each spring most of the winter steelhead runs escape the anglers. During recent years, the State fish and game agencies have released stocks of steelhead that return as early as October and spawn in late winter and early spring. This will expand the period that steelhead will be available for harvest and should result in a more satisfactory ratio between harvest and escapement. Summer steelhead have recently been introduced into the subregion and should also increase fishing opportunity and harvest.

A greatly increased need for fisherman access and boat launching sites will occur when chinook and coho salmon runs increase as a result of the new Willamette Falls fishway and increased propagation and enhancement upstream. Private development along the lower river, the Willamette Basin Greenway program, and the State's public access program are expected to result in an increased demand for these fish.

Provision of needed access will facilitate public use of fish resources. (Oregon State Game Commission)

The run of American shad in the lower Willamette could support a greatly increased harvest. An expanded educational program is needed to attract the public to this type of angling.

Resident salmonids are harvested to their maximum, except those in the high Cascade lakes. These lakes support excellent angling during the spring and fall, but summer angling declines apparently as a result of an abundant fish food supply and noxious insects that make angling unpleasant.

The Bull Run watershed of the Sandy River system is closed to public use, because it is the domestic water supply for the city of Portland. It has a potential for supplying a significant amount of high quality angling in a pristine setting if access were allowed.

Warmwater game fish are abundant in the warmer streams and lakes on the valley floor. These fish require little management to sustain the fishery, but better public access is needed particularly to the oxbow lakes associated with Willamette River. Approximately 30 of these lakes should be acquired by public agencies to insure their preservation, and access for fishing and other outdoor recreation.

Augmentation of Supply

As urban and industrial development of the Willamette Subregion continues, an increasingly greater share of projected angler needs must be met by artificial means.

Increased fish production can be accomplished in cultural facilities through water reuse, controlled water temperatures, improved feeds, disease control, automation, and other techniques. However, additional hatcheries will be needed to satisfy the rapidly increasing needs for resident trout fishing and to supply stock for anticipated increases in impoundment rearing of anadromous species. A hatchery-siting program will be needed to determine optimum locations for new facilities.

Hunting

Subregion 9 will need to support an additional 1,054,000 hunter-days by 2020. This goal can be reached only through an extensive program of habitat preservation to maintain present numbers of animals and provide a base for increasing future production through habitat improvement. This program is also needed to assure the public a place to hunt. Water resource development will offer few, if any, opportunities to provide additional hunting and will continue to reduce the amount of wildlife habitat in the subregion. Forecasts of increasing human populations indicate that urban-industrial development will cause major losses of habitat that

support wildlife species of the flood plain, including the ring-necked pheasant, valley quail, waterfowl, and many furbearers and nongame species. Comprehensive planning is essential if wildlife numbers are to be maintained at favorable levels in the future.

Habitat Preservation

Preservation of habitat will, of necessity, be accomplished mostly upon private and public lands not controlled by wildlife agencies. This program will depend somewhat upon the personal interest of landowners and their willingness to participate. In most instances, it will be necessary to purchase or lease areas of key habitat such as "pigeon springs." The proposed Willamette Basin Greenway offers considerable potential to preserve and improve upland habitat and provide more hunting.

Numerous opportunities exist for multipurpose planning to assure habitat preservation. Flood plain zoning and green belt planning have long been advocated by various groups to prevent destruction of highly productive agricultural or wildlife lands. This proposal would prevent indiscriminate construction of industrial sites, highways, and urban areas, which have little or no need for rich soil or marshes and wetlands. Once reserved by zoning, these lands could withstand occasional flooding and continue to provide agricultural crops and wildlife, plus open space and numerous recreational uses. This action could help preserve additional habitat by eliminating or minimizing flood control measures in upstream areas. Zoning should also be used outside flood plain areas to prevent loss of key habitat by highway construction, dredging, land filling, and farming practices.

The flood plain of the Willamette River and its major tributaries contains thousands of surface acres of natural lakes, marshes, sloughs, and river oxbows of value to waterfowl and many other wildlife species. Vast areas of seasonally flooded lands are also of high value, especially for waterfowl and waterfowl hunting. There is a need to preserve much of this habitat to perpetuate water-oriented wildlife species. Detailed studies are needed to identify specific locations of greatest value and measures needed to prevent the loss of these areas.

Habitat Improvement

The high percentage of private land presents a major habitat improvement problem. Landowners are reluctant to furnish land for wildlife if such action results in a loss of income. A zoning program as discussed above would not only preserve habitat, but provide areas where habitat improvement could be practiced.

A principal opportunity for habitat improvement is revegetating wildlife areas with desirable cover and food. Big game is dependent upon habitat below 2,000 feet in elevation during the winter, specifically where there is an abundance of low-growing vegetation for food, plus adequate protective cover. This type of habitat is of poorest quality in old growth timber and brush areas where low vegetation is sparse. Consequently, logging and fire generally create the most productive winter range. Specific measures to increase and improve low elevation deer and elk range could include special programs which would regulate timber harvest in accord with wildlife benefits. Some types of vegetation could be removed by controlled fire or other measures and benefit not only wildlife but the lumber industry as well by promoting regrowth of desirable timber.

Habitat improvement for upland game species of the flood plain should include measures to provide winter food and cover which consist naturally of wild plants such as rose, blackberry, and other low growing vegetation. These plants are generally classed as undesirable in agricultural areas and subject to destruction because they are "weeds" or are utilizing land that could be devoted to crop production. Most farm crops have little value to upland game during the critical winter period, and intensified farming has greatly reduced pheasant and quail populations in much of the subregion. Food and cover are also inadequate during the summer and fall in many areas.

Publicly financed irrigation or flood control projects should not only compensate for wildlife losses, but should make wildlife lands available as a project purpose. These lands could consist of canal banks, isolated land tracts, or specific wildlife management areas as proposed at Bureau of Reclamation's Monmouth-Dallas project. Depending upon local conditions, an assured water supply could be instrumental in realizing optimum production of food crops on wildlife lands.

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are included in table 71.

Greater Harvest

The greatest increases in hunting will result from more intensive use of the resource. Areas obtained for preservation and improvement of habitat will provide additional hunting opportunities, but will satisfy only a relatively small portion of the anticipated future demand. Satisfying all future needs is probably not feasible, but lease or purchase of hunting rights, public relations to obtain better access to private lands, and purchase or expansion of public hunting areas such as Sauvie Island, will permit better utilization

Table 71 - Wildlife Habitat Improvement Means, Subregion 9

Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Seeding and planting	acre	1,360	136	1,770	177.0	1,770	177.0
Forage release & prescribed burning	acre	9,800	53	5,800	61.5	2,800	58.5
Permanent openings	acre	410	41	540	54.0	530	53.0
Guzzlers	each	10	10	--	--	--	--
Shallow impoundments and marsh improvements	acre	130	98	170	128.0	160	120.0
Develop potholes	each	10	5	10	5.0	10	5.0
Develop nesting facilities	each	120	6	180	9.0	160	8.0
Sub-totals			349		434.5		421.5
Planning							
Big game range analysis	acre	1,134,100	113	Not available		Not available	
Upland game habitat surveys	acre	1,600,000	80	Not available		Not available	
Habitat management plans	each	24	12	Not available		Not available	
Sub-total			205				
Total			554				

Non-Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement[1/]	acre	30,000	810	25,000	675	15,000	405
Land acquisition[2/]	acre	18,000	2,635	8,000	1,171	7,000	1,024
Fencing[3/]	mile	15	22	15	22	15	22
Water developments[4/]	each	10	5	5	3	5	3
Totals			3,472		1,871		1,454

1/ Includes cover plots, food patches, marsh development, nest structures, etc.
2/ Obtained by fee purchase and easement rights.
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land, and to protect key wildlife habitat.
4/ Water developments consist primarily of guzzler installations and spring development (including fencing).

of the resource. Legislation is being drafted to permit the Secretary of Interior to acquire access rights to Federal lands that are now blocked from public use by intervening lands. Special hunts will also be used more extensively to obtain more efficient utilization of certain local game populations that could sustain greater harvest.

Augmentation of Supply

Satisfying future hunting needs will require a number of programs to increase the amount of wildlife on accessible hunting areas. Artificial propagation of upland game, especially pheasant, will increase. Introduction of exotic species may also be involved if research uncovers species that will adapt to local conditions and not conflict with other wildlife and domestic animals.

Transplanting native species may also be employed if local problems can be solved. For example, there is a good potential for increasing numbers of elk in this subregion and a restocking program is underway. However, many problems relating to elk depredation on privately-owned timberland and farmland must be resolved before re-stocking and habitat improvements can be implemented on some areas.

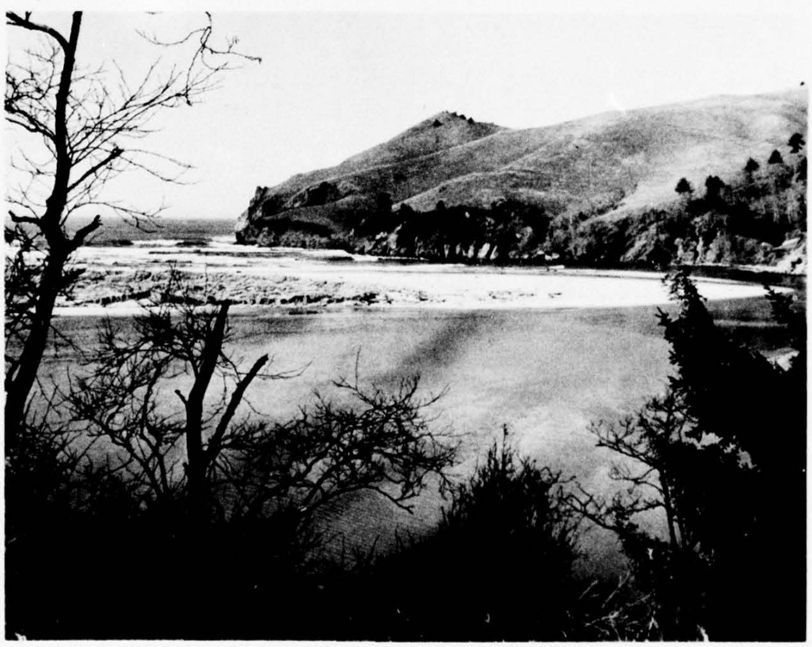
LOCATION MAP

SUBREGION 10

S U B R E G I O N 10, C O A S T A L

GENERAL DESCRIPTION OF SUBREGION

The Coastal Subregion is an area of about 23,500 square miles in western Oregon and Washington. It is bordered by California on the south, the Pacific Ocean on the west, Canada on the north, and by the summits of the Coast and Cascade Ranges on the east. This subregion lies mostly on the seaward slopes of coastal mountain ranges. Watersheds of many of the most famous steelhead and salmon producing rivers of the Pacific Northwest are included. Among the most prominent of these are the Soleduck, Bogachiel, Hoh, Queets, Quinault, Moclips, Humptulips, Chehalis, and Willapa in Washington; the lower reaches of the Columbia; and the Nehalem, Wilson, Trask, Nestucca, Salmon, Siletz, Yaquina, Alsea, Yachats, Siuslaw, Umpqua, Coquille, Rogue, and Chetco Rivers in Oregon. Most of these rivers empty into large bays and mingle with ocean waters. The estuarine environment created is an extremely complex and productive fish and wildlife area.



The coastal subregion's varied habitats support many species of fish, shellfish, and wildlife. (Oregon State Game Commission)

Much of the original old-growth timber has been logged or burned so second-growth and brush cover wide areas. The lower reaches of most river valleys, and lands bordering many bays and estuaries, have been cleared or are natural meadows. Dairying and livestock production are the principal agricultural industries. A few specialty crops such as bulbs, vegetables, and small fruits are grown.

The human population, 405,500, is concentrated in a narrow fringe along the coast and grouped in small towns around bays and river mouths. The principal industries are lumbering, shipping, fishing, and outdoor recreation.

Westerly winds predominate. The climate is humid. Precipitation is generally high, locally the highest in the contiguous United States, but varies widely depending on topography and location.

HISTORY OF FISH AND WILDLIFE

Foods from the sea, principally anadromous fish and shellfish, but also including several marine mammals, sustained large Indian populations in this subregion before the coming of the whites near the end of the 18th century.

The area, in general, was not particularly rich in furs except sea otter and fur seal; but mink, river otter, beaver, and muskrat were locally abundant. Upland game and some big game species were scarce. Black and grizzly bear were common. Waterfowl were very abundant.

Stocks of the marine furbearers were depleted soon after the white traders appeared and though Astoria, the first trading post in the Northwest, was located here, furs were relatively unimportant thereafter.

About the middle of the century small salmon salteries were established near the mouths of several rivers, particularly the Columbia (1857), and the Rogue (1859). About the same time, the Olympic oyster boom commenced. Principal oyster producing areas were Willapa Bay and Grays Harbor, Washington; Tillamook, Coos, and Yaquina Bays, Oregon. Fortunes were made by shipping these small native oysters to the San Francisco market, but stocks declined rapidly. When the tidelands were sold to oyster growers in the 1890's, oyster culture commenced and the lagging industry revived. Siltation from denuded forest lands and other pollution again caused declines beginning in the early 1920's, and most oyster lands are producing at only a small fraction of their original potential.

Canneries were established on most of the principal salmon-producing rivers soon after the first Columbia River cannery started operation (1866). The salmon catch was huge, particularly on the Columbia River near its mouth where traps and drag seines were used, and on the Umpqua, Coquille, Rogue, Moclips, and Chehalis Rivers. Overfishing, logging, pollution, dam construction, and perhaps other factors combined to reduce the runs, and all coastal rivers except the Columbia have now been closed to commercial salmon fishing, except by Indians. Limited commercial fisheries for striped bass and American shad are permitted in Coquille, Coos, Smith, Umpqua, and Siuslaw Rivers. Both these fish evidently spread north to Oregon from the original California plantings of the 1870's.

Elk, white-tailed deer, and bear populations were near all-time lows by the turn of the century. Black-tailed deer populations were probably not seriously reduced. Elk populations rebounded under the stimuli of strict regulation of kill and habitat improvement resulting from fire and lumbering. There are relict populations of white-tailed deer along the lower Columbia River. Black-tailed deer increased to high points reached in relatively recent years but appear to be suffering declines because cut- and burned-over areas have revegetated with brush and trees. Exotic upland game species have been introduced into the area, but neither native nor introduced species have become numerous enough to attract many hunters. Waterfowl numbers have declined drastically and are probably at the lowest point in history. Although there have been a few small drainage and land reclamation projects most of the decline may be traced to the destruction of nesting and wintering habitat, most of which is found outside of this subregion.

PRESENT STATUS

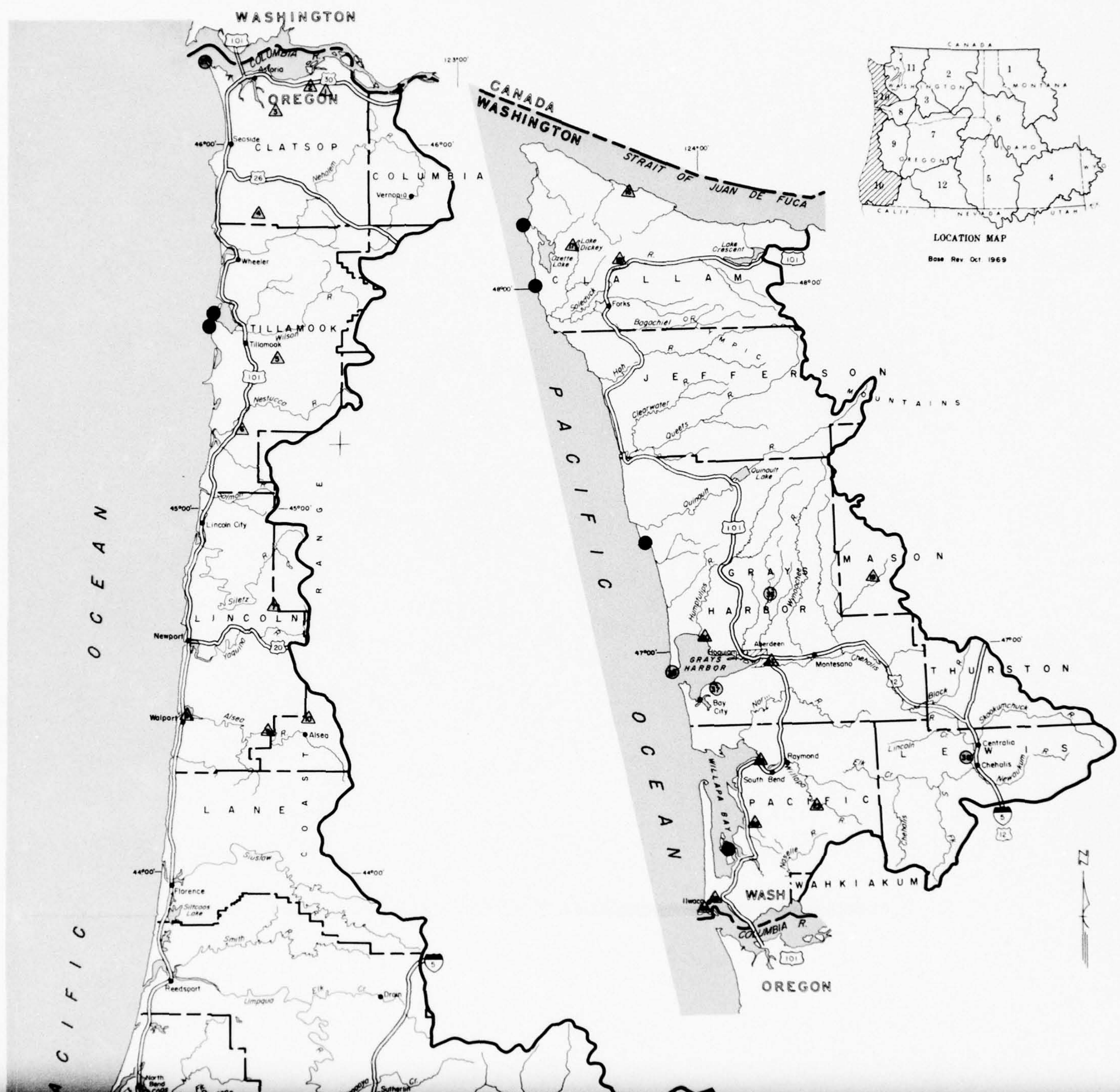
The groups of fish and wildlife are anadromous, resident, and marine fish, shellfish, big game, upland game, fur animals, waterfowl, and other wildlife.

Fish and wildlife resources are of major economic and recreational importance. The 1965 commercial harvest of marine fish (excluding anadromous fish) and shellfish amounted to approximately 56,600,000 pounds with a value to the fishermen of about $7,000,000 and a processed value of about $13,500,000. Expenditures associated with recreational use of resident and marine fish, shellfish, and wildlife amounted to about $21,000,000, for about 3,700,000 user-days of fishing and hunting. This does not include angling and expenditures associated with salmon and steelhead trout fishing. Many factors affect fish and wildlife resources of the subregion, but the most pronounced are man's activities that drastically alter fish and wildlife habitat.

FIGURE 35. EXPLANATION

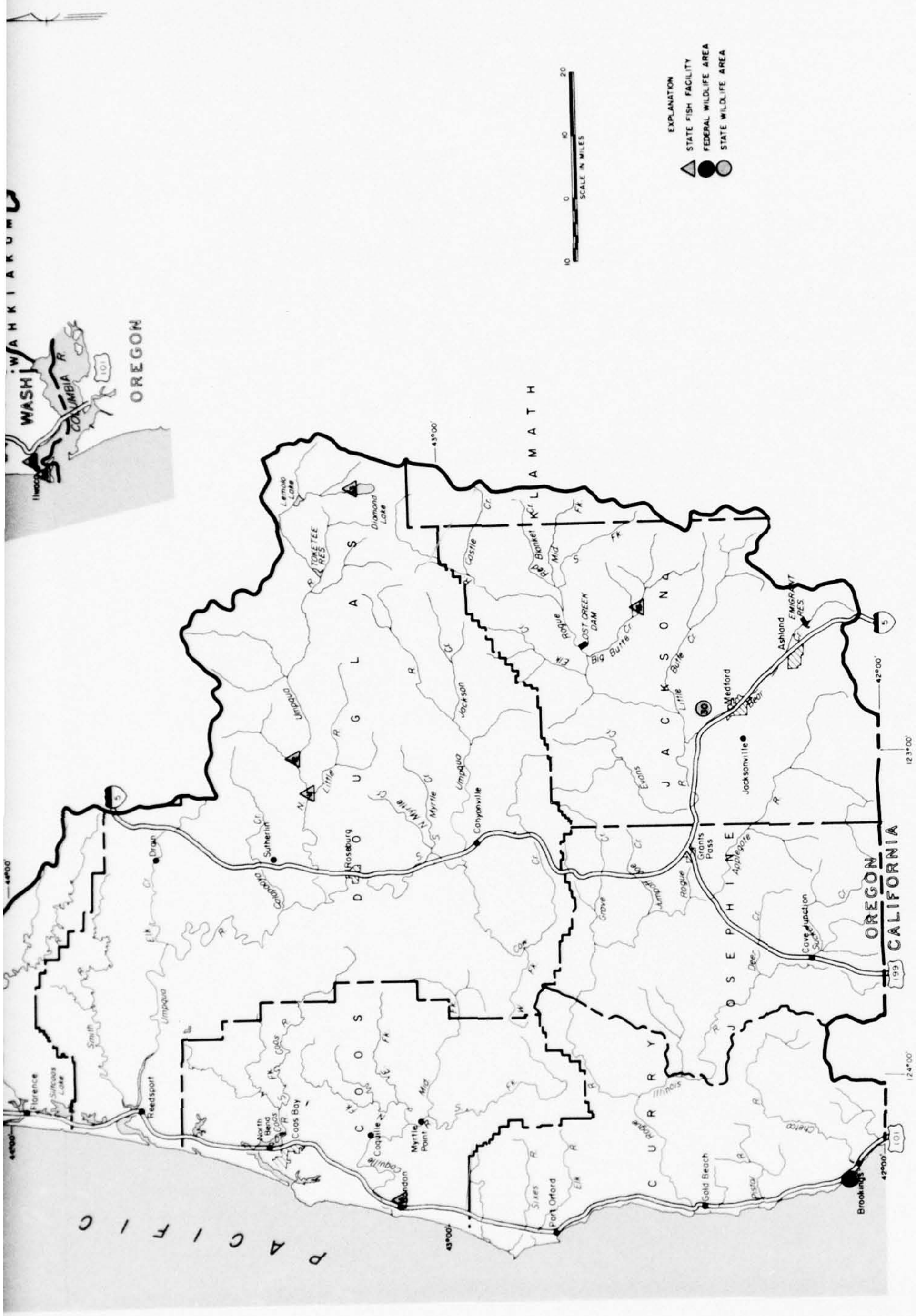
Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	Gnat Creek Hatchery		47,963
2	Big Creek Salmon Hatchery		83,437
3	Klaskanine River Salmon Hatchery		149,582
4	Nehalem River Salmon Hatchery		22,505
5	Trask River Salmon Hatchery		41,460
6	Cedar Creek Hatchery		61,790
7	Siletz River Salmon Hatchery		33,785
8	Lint Slough Rearing Area	30	4,380
9	Alsea River Salmon Hatchery		46,730
10	Alsea Hatchery		41,368
11	Whistler's Bend Rearing Area	35	980
12	Rock Creek Hatchery		48,584
13	Diamond Lake Hatchery		1/
14	Bandon Hatchery		48,936
15	Butte Falls Hatchery		48,630
16	Clallam Pond Rearing Area	10	236,300 2/
17	Dickey Lake Rearing Area	588	183,100 2/
18	Pleasant Lake Rearing Area	500	182,000 2/
19	Simpson State Salmon Hatchery		57,514
20	Campbell Slough Rearing Area	10	67,100 2/
21	Aberdeen Hatchery		45,000
22	Johnson Slough Rearing Area	25	75,700 2/
23	Willapa State Salmon Hatchery		33,741
24	Nemah State Salmon Hatchery		29,061
25	Black Lake Rearing Area	30	109,900 2/
26	Chinook River Rearing Area	50	948,650 2/
27	Fort Stevens Game Mgt. Area	1,447	
28	Cape Meares National Wildlife Refuge	139	
29	Three Arch Rocks National Wildlife Refuge	17	
30	Kenneth Denman Game Management Area	1,920	
31	Oregon Islands National Wildlife Refuge	21	
32	Flattery Rocks National Wildlife Refuge	125	
33	Quillayute Needles National Wildlife Refuge	117	
34	Copalis National Wildlife Refuge	5	
35	Olympic Wildlife-Recreation Area	962	
36	Oyehut Wildlife-Recreation Area	683	
37	Johns River Wildlife-Recreation Area	1,053	
38	Centralia Game Farm	213	
39	Willapa National Wildlife Refuge	8,175	

1/ Egg taking only.
2/ Numbers of fish.



WASHINGTON
OREGON
CANADA
WASHINGTON
STRAIT OF JUAN DE FUCA
PACIFIC OCEAN
OCEAN
CLATSOP
COLUMBIA
TILLAMOOK
LINCOLN
LANE
COAST RANGE
CLALLAM
JEFFERSON
OLYMPIC MOUNTAINS
GRAYS HARBOR
MASON
THURSTON
LEWIS
PACIFIC
WAHKIAKUM
WASH
OREGON
COLUMBIA R.
GRAYS HARBOR
WILLAPA BAY
Astoria
Seaside
Vernonia
Wheeler
Tillamook
Lincoln City
Newport
Waldport
Alsea
Florence
Reedsport
Drain
Sutherlin
Forks
Aberdeen
Hoquiam
Montesano
Bay City
Raymond
South Bend
Ilwaco
Centralia
Chehalis
LOCATION MAP
Base Rev Oct 1969

2



COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

COASTAL SUBREGION 10

1970

FIGURE 35

Figure 35 portrays and identifies State and Federal fish and wildlife lands and facilities. These installations and areas are of special value to one or more kinds of fish and wildlife.

Anadromous Fish

The Coastal Subregion is of major importance in the production and harvest of salmon and steelhead trout. However, the commercial and sport fisheries involve fish produced in several other portions of the Columbia-North Pacific Region, and the relative importance of fish from the subregion is not known. Because of this intermingling of regional stocks of fish, a regional analysis of the present status is presented in the "Regional Summary."

Coastal waters are a mecca for salmon anglers. (Oregon State Game Commission)

Resident Fish

Freshwater game species include rainbow, cutthroat, and brook trouts, Dolly Varden, mountain whitefish, kokanee, largemouth bass, bluegill, black crappie, brown bullhead, and yellow perch. Nongame fish include squawfish, carp, chub, sucker, sculpin, and stickleback.

Habitat

Resident salmonids are found in rivers and lakes from sea level to more than 5,000 feet. Highest quality habitat is found in waters having relatively low temperatures and little pollution.

Warmwater and nongame fish are most abundant at lower elevations. Lakes on Long Beach Peninsula, Washington, are locally well known for providing warmwater fish and the Siltcoos-Tenmile Lake area of Oregon is famous as a producer of largemouth bass and other species.

These less popular species are more tolerant of higher water temperatures and poorer water quality than are salmonids.

Use

The 1965 sport fishing use of resident fish, including hatchery fish, was about 1,200,000 angler-days. Much of the fishing was by persons living outside the subregion. A breakdown of sport fishing use is shown in table 72.

Table 72 - Estimated Sport Fishing Use of Resident Fish, Subregion 10, 1965 1/

Waters	Angler-Days		
	Oregon	Washington	Totals
Streams	387,696	198,466	586,162
Lakes and Ponds	456,619	144,798 2/	601,417 2/
Reservoirs	17,230	--	17,230
Totals	861,545	343,264	1,204,809

1/ Derived from Oregon and Washington State fishing-use data.
2/ Washington data include lakes, ponds, and reservoirs in one group.

Angling for resident fish is one of the major recreation outlets for inhabitants of the subregion. Estimated expenditures by sport fishermen were about $6,000,000 in 1965.

Natural production of resident salmonids cannot satisfy fishing pressure in most waters, and stocking with hatchery fish is necessary. Some inaccessible streams and lakes have small populations of "surplus" fish, but optimum harvest at these locations would not change angler use materially. Warmwater fish could stand a significant increase in harvest. Fishing for these species is rapidly increasing in popularity and a greater harvest increase is expected in the near future.

Factors Affecting Resource

Resident fish are subjected to a variety of limiting factors. A number of streams, Columbia River in particular, have been drastically altered by man's activities and demands for water. Impoundments, channeling, pollution, indiscriminate use of herbicides and pesticides, water withdrawal, logging, farming, road construction, and mining have reduced area and quality of salmonid habitat. Timber harvest and associated road construction have probably been the factors of most importance. Warmwater and nongame fish are less influenced by these limiting factors than are trout, but low water temperatures and other factors preclude their survival in many areas.

Beneficial activities influencing resident game fish include pollution and erosion control, control of undesirable fish, reservoir construction, and regulation of catch. About 60 acres of farm ponds in the subregion are managed for fish production.

Restricted access to some private and municipal lands is a major factor limiting use of resident game fish. Improved access is provided at numerous camping and picnic sites, and at special fishing access areas acquired and developed by fish and game agencies. Eight State fish hatcheries produce resident salmonids.

Marine Fish and Shellfish

Many species of fish and shellfish are found in marine, estuarine, and open beach areas. Included are lingcod, starry flounder, sole, Pacific herring, perch, surf smelt, rockfish, oyster, razor, littleneck, horse, jackknife, butter, softshell, cockle, and geoduck clams, shrimp, Dungeness crab, and others.

Many Oregon and Washington beaches support razor clams which are by far the most popular shellfish sought by sportsmen. Annually, as many as 583,000 diggers may be on Washington beaches, which generally support higher clam populations than do Oregon beaches. The commercial harvest of this species has declined in recent years because of the tremendous sport digging demand. Bay clams, particularly softshell, littleneck, cockle, and butter clams, are numerous in shallow bays all along the coast. These have never been as popular with diggers as razor clams and except in localized areas could sustain a larger harvest. There is a small commercial harvest of bay clams. Oysters, Olympia and Japanese or Pacific, are found in quantity in several of the larger bays: Coos Bay, Yaquina Bay, and Tillamook Bay in Oregon; Willapa Bay and Grays Harbor in Washington. Most of these are in commercial oyster beds and there is little sport harvest.

Crabs are harvested all along the coast. Most of the commercial catch is from the shallow offshore areas, and the sport catch is almost all from the bays. There are indications that the catch may be at a maximum.

Shrimp and bottomfish are caught offshore and landed at many of the ports along the coast. These resources are probably large enough to support a larger harvest. Sport fishing for perch, greenling, rockfish, lingcod, and other "bottomfish" is popular at many rocky areas along the coast and from breakwaters and jetties wherever they jut into the ocean. Perch and flounder are caught in most bay areas.

Habitat

Habitat requirements of saltwater species are extremely variable, and one or more varieties can be found in most marine and estuarine areas. However, most larval shellfish have fairly narrow tolerances to changes in salinity, temperature, and dissolved oxygen which tend to limit their distribution.

Use

The 1965 commercial harvest was about 38,000,000 pounds of marine fish and 18,500,000 pounds of shellfish. It is estimated that recreational use amounted to more than 633,000 angler-days for marine fish and about 952,000 man-days harvesting shellfish. Several species could withstand greater harvest.

Commercially harvested marine fish and shellfish had 1965 values of about $1,870,000 and $5,200,000, respectively, to the fishermen. Recreational expenditures amounted to approximately $3,000,000 for marine angling and $4,700,000 for shellfish harvest.

Factors Affecting Resource

A principal limiting factor has been and continues to be the piecemeal destruction of estuaries and bays by private and public interests. Under the Rivers and Harbors Act of 1899, the development and maintenance of port facilities, marinas, and urban-industrial sites, and the associated dredging and filling of bays, has been regulated primarily on the basis of impact on navigation. Other detrimental factors include pollution, siltation, and heavy wave and surf action which causes beach erosion and formation of shifting sandbars. Oil and cargo spillage from marine shipping or dockside facilities is also extremely detrimental to marine and estuarine resources.

Marine fish angling is often productive. (Washington Department of Fisheries)

Tideland fauna and flora suffer irreparable damage from man's drive to develop the land. (Oregon State Game Commission)

The resource benefits mostly from pollution control and the inaccessibility of some areas which discourage development for other purposes. Several State and Federal agencies are engaged in research and management of the resource. Zoning has been applied to port and industrial development as a means to ensure multipurpose use of the areas involved.

Big Game

Black-tailed deer, Roosevelt elk, and black bear are the principal big game. Small numbers of mountain lion are present, and there is a relict population of Columbian white-tailed deer. Black-tailed deer range throughout the subregion. They probably attained peak populations several years ago and have suffered slight declines recently. White-tailed deer still exist in brushy bottomlands and on islands of the lower Columbia River and are classified as rare. Elk range rather widely, particularly in the southern Olympics and the Tillamook Burn and Millicoma areas of Oregon. Mountain lion also range widely, mostly at high elevations. Black bear are fairly common away from human disturbances.

Habitat

Greatest numbers of deer, elk, and bear are found in logged areas and burns where dense brush and closed-canopy timber have been removed and forage and browse are most abundant. Lesser numbers are found in dense timber and brush, and on steep terrain. Some of the best deer producing areas are farmlands where brushy woodlots are interspersed with cultivated fields. Wintering areas for deer and elk are not critically defined but are usually located below 1,500 feet in low snowfall areas.

Use

Hunting effort amounted to about 587,000 man-days in 1965. An analysis of this use is shown in table 73.

Table 73 - Estimated Hunting Use of Big Game, Subregion 10, 1965 1/

	Hunter-Days		
Species	Oregon	Washington	Totals
Deer	218,000	138,000	356,000
Elk	102,000	115,500	217,500
Bear	3,000	10,500	13,500
Totals	323,000	264,000	587,000

1/ Estimates based on data obtained from fish and game agencies of respective States.

Big game provided about 62 percent of the hunting in the subregion in 1965. Estimated expenditures for items directly associated with this hunting amounted to more than $5,500,000.

Much of the bear hunting and harvest is incidental to deer and elk hunting. A large portion of the hunting pressure is provided by persons living outside the subregion.

Deer and bear could withstand more hunting, but much of the potential is in areas that are relatively inaccessible or are closed to public access. Elk are hunted to near maximum.

Factors Affecting Resource

Few water development projects have been constructed in this subregion and their impact on big game resources has been negligible. A number of projects have recently been proposed or authorized and are threatening individual tracts of big game habitat. Urban and industrial expansion, highway construction, and many other activities have destroyed valuable big game habitat.

The principal factors benefiting deer, elk, and bear are logging and fire which remove closed-canopy timber and facilitate growth of browse and forage. Oregon and Washington wildlife management agencies are conducting special studies to determine improved management techniques. Washington Department of Game operates the Olympic Wildlife-Recreation Area near Aberdeen. Nearly 3,000 acres of wildlife habitat, consisting of permanent clearings, have been created on national forest lands within the subregion during the past three years.

A major factor affecting hunter use is lack of adequate public roads into many good hunting areas. Most public lands and many private farms and timber tracts are open for hunting. Significant portions of the subregion in the State of Washington provide limited or no hunting opportunities. Indian reservations do not permit hunting by non-Indians, and the Olympic National Park is closed to all hunting.

Upland Game

Principal upland game are blue and ruffed grouse, band-tailed pigeon, ring-necked pheasant, mourning dove, valley and mountain quails, snowshoe rabbit, and gray squirrel.

Habitat

Ruffed and blue grouse, band-tailed pigeon, and mountain quail are primarily inhabitants of the foothills and mountains.

Ring-necked pheasant, valley quail, and mourning dove are present in the greatest numbers in grain production areas of which there are very few in this subregion. Lesser numbers are found throughout the remaining lowland agricultural areas. Snowshoe rabbit are found in forest and brushland throughout the subregion. Most of the gray squirrel are in the upper river valleys, but they may range to the sea along the central Oregon coast.

Use

Hunting effort in 1965 was about 235,000 man-days. Most of the hunting was by inhabitants of the subregion. Table 74 presents an analysis of this use.

Table 74 - Estimated Hunting Use of Upland Game, Subregion 10, 1965 1/

Species	Hunter-Days Oregon	Hunter-Days Washington	Hunter-Days Totals
Pheasant	29,000	21,000	50,000
Quail	12,500	500	13,000
Grouse	7,000	73,000	80,000
Mourning Dove	15,500	500	16,000
Band-tailed Pigeon	31,000	32,000	63,000
Rabbit	--	1,000	1,000
Squirrel	12,000	--	12,000
Totals	107,000	128,000	235,000

1/ Based on Oregon and Washington game harvest data.

Upland game provided about 25 percent of the hunting in the subregion in 1965, resulting in an estimated expenditure of $1,100,000.

With the exception of grouse, snowshoe rabbit, and perhaps quail, the upland game resource could not sustain any major increase in hunting pressure.

Factors Affecting Resource

There has been little water project development in this subregion but other activities have been detrimental to upland game. Highway construction, industrial development, and urban expansion have destroyed large areas of habitat. Farming methods involving spraying and clean farming have reduced food, cover, and game numbers.

Activities most beneficial to pheasant, quail, and mourning dove include grain production, cover plantings, and retention of brush and nesting cover. Grouse and band-tailed pigeon are enhanced by removal of dense timber which facilitates growth of desired food plants. Management activities benefiting upland game are conducted on two national wildlife refuges and four State wildlife areas. A game farm operated by Washington Department of Game at Centralia produces pheasant stocked in part of this subregion. Some farmers have a personal interest in upland game, and leave scattered patches of food and cover on their lands for wildlife use.

Posting of private lands is common and seriously reduces hunting opportunity in some areas. Wildlife management agencies are seeking to improve landowner-sportsman relations and obtain access privileges for the general public.

Fur Animals

Fur animals include beaver, muskrat, mink, marten, river otter, raccoon, bobcat, fox, coyote, skunk, and weasel. Fur seal migrate along the coast but are Federally-protected with no hunting permitted in this subregion.

Habitat

The lower reaches of most of the rivers, bays, and freshwater lakes support high mink and raccoon populations. Muskrat are common in fresh, and sometimes brackish, water areas, particularly around the coastal freshwater lakes. Most other species are widely dispersed, but at times locally abundant.

Use

Approximately 19,000 fur animals were trapped during the 1965-66 season. Muskrat and beaver pelts made up about 80 percent of the total harvest. The remaining 20 percent was mostly raccoon, mink, and river otter. Pelts from the subregion during the 1965-66 season had a value of more than $110,000. Harvest of some species could be greater, but much of the potential consists of low value pelts.

Factors Affecting Resource

Several factors are detrimental to fur animals. The most obvious is habitat destruction by pollution, drainage, channeling, and urban and industrial expansion. Water-oriented species are most commonly affected by man's activities.

Development of waterfowl habitat by State, Federal, and some private groups has resulted in incidental benefits to fur animals. Management is limited almost entirely to harvest regulation.

Fur value is the greatest factor affecting resource use. Several species will remain underharvested at present prices.

Waterfowl

Coastal Subregion attracts more than 20 species of ducks, Canada goose, snow goose, white-fronted goose, black brant, and coot.

Waterfowl are primarily migratory inhabitants during their spring and fall flights to and from northern nesting areas. However, moderate numbers of waterfowl winter and several species of ducks nest in the subregion.

Habitat

Highest quality habitat consists of tidelands, marshes, lakes, and agricultural lands. Large areas of open water serve as resting habitat. Eelgrass beds of the subregion are extremely important to black brant.

Use

Hunting use in 1965 was about 97,000 man-days. An analysis of this use is shown in table 75. Most of the hunting was by inhabitants of the subregion.

Table 75 - Estimated Hunting Use of Waterfowl, Subregion 10, 1965 1/

Waterfowl Group	Hunter-Days		
	Oregon	Washington	Totals
Ducks	31,000	54,000	85,000
Geese	5,000	7,000	12,000
Totals	36,000	61,000	97,000

1/ Based on Oregon and Washington game harvest data.

Waterfowl provided about 10 percent of the total hunting in the subregion in 1965. Estimated expenditures by waterfowl hunters in 1965 amounted to about $624,000.

Several species of waterfowl could withstand greater hunter pressure and harvest. These are mostly diving and sea ducks which are more difficult to hunt and not as much desired by hunters as pond duck, goose, and brant. Coot are seldom hunted.

Factors Affecting Resource

Waterfowl are affected detrimentally by a variety of factors, but especially destruction of marsh and estuarine areas by dredging and filling, drainage, channeling, and urban, industrial, and agricultural development. The Washington Department of Game operates two waterfowl ranges, and the Bureau of Sport Fisheries and Wildlife administers one refuge primarily for waterfowl. In addition to waterfowl enhancement and hunting, these areas also provide public fishing and other outdoor recreation. Other beneficial activities include waterfowl habitat development and preservation by private organizations such as gun and conservation clubs, and by farmers.

Major factors affecting waterfowl hunting are water conditions, weather, and access. Weather plays an important role in waterfowl movements and hunting. Mild weather often delays migration from the north and restricts early season hunting. Restricted access to private lands and gun clubs minimizes use of the resource.

Public hunting is provided on Washington Department of Game's wildlife management areas and on one national wildlife refuge. Public access to rivers, lakes, and impoundments permits hunters to reach many good hunting sites via boat.

Other Wildlife

The Coastal Subregion supports many species of wildlife which are important because they are either injurious, are hunted by sportsmen, or are esthetically pleasing. Rats, mice, moles, starlings, and blackbirds are injurious species that destroy foodstuffs or interfere with agriculture. Feral pigeon and other species are hunted for recreation or food. Hunting for this group amounted to about 29,000 man-days in 1965, about 3 percent of the total in the subregion. Hunting pressure on these animals could be increased significantly.

The coast serves as a migration route and breeding area for songbirds, raptors, waterbirds, and shorebirds of great interest to bird watchers and other naturalists. Small rocky islands along the coast are maintained as national wildlife refuges for the many species

of seabirds that frequent this coast. Shearwater, fulmar, pelican, turnstone, tattler, kittiwake, tern, guillemot, and others are migrant visitors. Petrel, cormorant, oystercatcher, gull, murre, murrelet, auklet, and puffin nest.

Myriad numbers of shorebirds and seabirds enhance the coastal environment. (Bureau of Sport Fisheries and Wildlife)

Several sea mammals including the largest whales migrate offshore. Steller's sea lion, California sea lion, and harbor seal are conspicuous residents.

Many factors affecting big game, upland game, fur animals, and waterfowl also influence this group.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

Anticipated agricultural, urban, and industrial development is expected to impose serious threats to fish and wildlife habitat

in some portions of the subregion. Satisfying future demands for fishing and hunting will require extensive programs to preserve and enhance the habitat base, and continued artificial propagation of some species.

Fishing

Subregion 10 will need to support an additional 1,680,000 angler-days for resident fish, 886,000 angler-days for marine fish, and 1,333,000 man-days for shellfish by the year 2020. Coastal streams must provide a substantial portion of the anadromous fish needed to satisfy the region's expanding sport and commercial fisheries. Commercial harvest will require an additional 53,000,000 pounds of marine fish and 27,000,000 pounds of shellfish.

A number of State and Federal programs are expected to enhance fish and shellfish resources, but these actions alone will not satisfy all future sport and commercial uses. Satisfying the future needs will depend heavily upon habitat preservation, and this will require close coordination of many agencies as well as land and water users. Fish numbers and use can be increased through habitat improvement, artificial propagation, improved access for anglers, and a variety of other management programs.

Habitat Preservation

Preservation of streams and rivers should include maintenance of proper flows, optimum water quality, and related physical characteristics, including pools and riffles, meanders, bank vegetation, and bottom materials. Accomplishing this goal will require proper watershed management such as protection from channeling, gravel removal, waste disposal, livestock grazing, and other conflicting factors. All of the major river systems and many associated tributaries need to be retained in a free-flowing state to permit natural propagation of anadromous and resident fish. This does not, however, preclude development of water storage at upper watershed or off-channel sites where such storage can contribute to desired flows, optimum water quality, and other essential conditions.

The coastal subregion contains many estuarine areas. Under natural conditions, these areas are more productive than choice farmland and provide large amounts of outdoor recreation compatible with sport and commercial fisheries. Pollution, dredging, and filling have had serious impacts on many of the subregion's estuaries and have resulted in major losses of recreational and commercial use of fish and shellfish. The remaining estuarine habitat should be protected and its values incorporated into comprehensive plans designed to permit urban-industrial development and other uses only where they are found to be compatible with fish and shellfish

resources. Such a plan has been prepared for Yaquina Bay, Oregon, and similar plans are needed for the following estuarine areas:

Washington
- Columbia River mouth
- Willapa Bay
- Grays Harbor

Oregon
- Rogue River estuary
- Coquille River estuary
- Coos Bay
- Winchester Bay
- Siuslaw Bay
- Alsea Bay
- Siletz Bay
- Salmon River
- Nestucca Bay
- Sand Lake
- Netarts Bay
- Tillamook Bay
- Nehalem Bay
- Youngs Bay
- Columbia River mouth

Habitat Improvement

Improvement of habitat for resident and anadromous salmonids should include programs to structurally change the habitat, as well as improve water quality. Gabions, sills, and weirs could be used on most streams to improve the pool-riffle ratio and increase spawning and rearing area. Much spawning area has become impacted with silt, and could be greatly improved by mechanical cleaning and flushing. Stored water could provide increased flows and improve stream water quality. Water quality could also be improved by rehabilitation of areas damaged by logging, roadbuilding, grazing, and other activities.

A principal habitat improvement requirement in Subregion 10 is the need to increase the amount of spawning area accessible to anadromous fish. This would require removal of or passage over falls or obstructions that restrict upstream movement. Many of these barriers are identified in the following list. Additional studies are needed to determine the measures, costs, and benefits involved with specific barriers. Many other barriers exist, and further studies are needed to identify locations and define corrective measures.

Washington
- Wishkah River
  - Mainstem - falls
  - Big Creek - falls and old splash dam
- Humptulips River
  - Big Creek - falls
  - Jones Creek - falls
  - Furlow Creek - falls
  - Goforth Creek (East Fork Humptulips tributary) - falls
  - Chester Creek (West Fork Humptulips tributary) - falls
- Chehalis River
  - Mainstem - falls
  - Falls Creek (Cloquallum Creek tributary) - falls
  - Porter Creek - falls
  - North Fork Porter Creek - falls
  - North Fork Chehalis River - Fish Falls (barrier at some flows)
- Wynoochee River
  - West Fork Falls
- West Fork Satsop River
  - Spoon Creek (area) - falls
- North Fork Palix River
  - Many falls
- Falls River
  - Dean Creek - falls
- North Fork Naselle River
  - Mainstem - falls
- Skookumchuck River
  - Mainstem and tributaries - falls
- Willapa River
  - Several tributaries - falls
- Strait of Juan De Fuca
  - Mill Creek - falls
  - Lake Creek - falls

Oregon
- Small Columbia River tributaries
  - Lewis and Clark River - falls
  - South Fork Klaskanine River - 4 falls
  - Youngs River - falls
  - Beaver Creek - falls
- Nehalem River
  - Dry Creek (Cook Creek tributary) - falls
  - South Fork Cronin Creek - cascade falls
  - Fishhawk Creek No. 1 - falls
  - Little Fishhawk Creek - falls
  - Lost Creek - falls
  - Buchanan Creek - falls, cascade
  - Falls Creek - series of falls
  - Big Rockheap Creek - falls

North Fork Salmonberry River - 3 falls
Salmonberry River - falls
Wolf Creek - falls
Grassy Lake Creek - falls

Wilson River
Jordan Creek - series of falls
Little North Fork - steep gradient
Drift Creek - falls

Trask River
Middle Fork - 3 falls
East Fork (South Fork Trask River tributary) - falls
South Fork Gold Creek - falls
North Fork (North Fork Trask River tributary) - 3 falls
East Fork (North Fork Trask River tributary) - falls
Bark Shanty Creek - 2 falls

Miami River
Mainstem - falls

Nestucca River
Mainstem - falls
Slickrock Creek - falls
Bear Creek - falls
Squaw Creek - 3 falls
Little Nestucca River - falls
Bible Creek - falls
Erickson Creek - falls, dam

Salmon River
Treat River - falls
Deer Creek - falls

Siletz River
Boulder Creek - falls
North Fork Schooner Creek - falls
South Fork Schooner Creek - falls
Euchre Creek - 2 falls
Thompson Creek - 2 falls
North Fork Rock Creek - falls
South Drift Creek - falls

Yaquina River
Mainstem - falls
Bear Creek (Elk Creek tributary) - falls
Little Yaquina River - 3 falls

Alsea River
Eckman Creek - falls
Sudan Creek - 2 falls
Grass Creek - falls
South Fork Alsea River - falls
North Fork Alsea River - falls
Racks Creek - falls
Peake Creek - falls
Hunt Creek - dam, 2 falls

Siuslaw River
- Mainstem - rock at Siuslaw Falls
- Mainstem and tributaries - many log jams
- Lake Creek - falls
- Sweet Creek - falls
- Wilhelm Creek - falls

Umpqua River
- Coffee Creek - falls
- City Creek - log jam
- North Fork Calapooya Creek - log jam
- Pass Creek - falls
- North Umpqua River - cascade
- Russe Creek - falls
- Mill Creek - cascade
- Camp Creek - falls
- Little Mill Creek - cascade

Coos River
- Elk Creek (West Fork Millicoma River tributary) - falls
- Elk Creek (South Fork Coos River tributary) - falls
- Fall Creek (South Fork Coos River tributary) - falls
- Burnt Creek - culvert
- Hog Ranch Creek - culvert
- Glenn Creek - falls
- Matson Creek - falls
- Tioga Creek - falls

Smith River
- Spencer Creek - falls
- Wasson Creek - falls
- Scare Creek - falls

Coquille River
- East Fork Coquille River - natural gorge
- Middle Fork Coquille River - natural gorge
- Rock Creek (Middle Fork Coquille River tributary) - cascades
- Myrtle Creek - natural gorge
- Cherry Creek - falls
- Coal Creek (South Fork Coquille River tributary) - cascades
- South Fork Coquille River - falls
- Butler Creek - log jam

Floras Creek
- North Fork Floras Creek

Fish migration is blocked by a number of structures downstream from significant spawning areas. Successful passage at the following dams could provide substantial benefit:

Washington
- Agnew Dam (lower Skookumchuck River)

Oregon
- Warrenton water supply dam (Lewis and Clark River)
- Seaside water supply dam[1/] (Necanicum River)
- Unnamed dam (river mile 8, South Fork Alsea River)
- Huct Mill Dam (Siuslaw River)
- Canyonville diversion dam (O'Shea Creek - Umpqua River)
- Murphy Dam (Applegate River)
- McKee Dam (Applegate River)
- Steves Fork Dam (Carberry Creek - Applegate River)
- Fielder Dam (Evans Creek - Rogue River)
- Mission Bell Dam (Evans Creek - Rogue River)
- Jumpoff Joe Dam (Rogue River)
- Houston Dam (Little Applegate River)
- Savage Rapids Dam[1/] (Rogue River)
- Watts-Topin Dam (Rogue River)
- Yale Creek Dam (Rogue River)

Water pollution seriously restricts fish and shellfish populations in many streams and estuaries. The most common pollution sources include mill waste, sewage, log storage, petroleum residues, and domestic-industrial garbage. Improved water quality in the following waters would benefit fish and shellfish resources:

Washington
- Chehalis River (especially in lower reaches)
- Grays Harbor
- Willapa Bay
- Columbia River

Oregon
- Columbia River
- Youngs Bay
- Tillamook Bay
- Siletz Bay
- Yaquina Bay
- Alsea Bay
- Siuslaw River - lower 8 miles plus all tidal areas
- South Umpqua River
- Umpqua River tidal areas
- Deer Creek (Umpqua River tributary)
- Cow Creek (Umpqua River tributary)
- Elk Creek (Umpqua River tributary)
- Isthmus Slough (Coos River)
- South Fork Coos River - tidal
- Millicoma River - tidal
- Coos Bay - lower
- Kentuck Creek (Coos Bay tributary)

1/ Existing fish ladder needs improvement.

Inadequate streamflow is a problem in many streams. In some instances, this delays upstream migration of anadromous species and causes loss of fish via direct mortality or poor spawning conditions. Low flows usually occur during the summer and fall months, but stream diversion for municipal-industrial uses may create problems throughout the year. Much study is needed to determine specific needs by volume, date, and stream and procedures to determine the benefits that would be derived. The following streams are known to have inadequate flows, and flow augmentation could significantly benefit anadromous salmonids as well as resident trout production:

- Washington
  - Wynoochee River (downstream from Aberdeen city diversion)
  - Wishkah River (downstream from Aberdeen city diversion)
  - Upper Skookumchuck River
  - Newaukum River
  - Olequa Creek
  - Lincoln Creek
  - Stillman Creek
  - South Fork Chehalis River

- Oregon
  - Alsea River
    - North Fork (Gravel Creek to mouth)
    - South Fork (Peak Creek to mouth)
    - Mainstem
  - Siuslaw River
    - Mainstem
  - Umpqua River
    - South Fork (downstream from Elk Creek)
    - Cow Creek
    - Elk Creek
    - Olalla Creek
  - Necanicum River
    - Mainstem

Construction of small impoundments are needed to provide fish rearing areas and the public a place to fish. Locations for such development are identified in the following list. Specific costs of dams, access roads, and parking lots are not known.

- Washington
  - Big Creek (Wishkah River tributary)
  - East Fork Wishkah River
  - Lower Wynoochee River
  - Gold Creek

- Oregon
  - North Fork Klaskanine River
  - Miami River

Nestucca River (river mile 40-45)
East Creek
Walker Creek
Devils Lake Fork (Wilson River tributary)
Warnick Creek (Siletz River tributary)
Rock Creek (Siletz River tributary) (river mile 1-5)
Buck Creek (Siletz River tributary) (river mile 1-4)
Sunshine Creek (Siletz River tributary) (river mile 1-4)
Drift Creek (Siletz River tributary) (river mile 15-18)
Gopher Creek (Alsea River tributary)
Five Rivers (Alsea River tributary) (river mile 1-15)
South Fork Alsea River (river mile 1-10)
Drift Creek (Alsea River tributary) (river mile 3-22)
Siuslaw River
Sweet Creek
Davis Slough (Coos Bay tributary)
Coquille River area
Eden Valley (South Fork Coquille River)
Horse Creek (Illinois River tributary)
Big Elk Creek (river mile 3-22)

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 76.

Greater Harvest

Anadromous fish are utilized to the maximum in most subregion waters. However, some additional fishing for winter steelhead in streams may be available where poor angler access prevents optimum harvest. So called "hatchery surpluses" also may provide more fish for the sport and commercial fisheries. For planning purposes, however, it cannot be assumed that present numbers of anadromous fish could withstand a major increase in angling. Satisfying future needs will require increasing the numbers of fish available by methods discussed elsewhere in this appendix.

Resident salmonids could provide some additional sport angling at present population levels. This potential exists mostly in lakes or streams that are difficult to reach or fish. Maximum use of the available fish would not satisfy all future needs but could provide very important contributions in some areas if angler access were provided.

Many species of warmwater and marine fish are underutilized and can satisfy future needs for this element of the sport fishery if present populations are maintained and better angler access is provided. Shellfish populations, however, are being utilized heavily in most accessible areas and only moderate increases can be realized until access is improved. Razor clams are being utilized

Table 76 - Fish Habitat Improvement Means, Subregion 10

Measure	Unit	Federal 1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Stream improvement	mile	150	300.0	220	440.0	190	380.0
Spawning bed improvement	mile	52	98.8	105	199.5	107	203.3
Rough fish removal (streams)	mile	5	--	80	.2	70	.2
Stream channel preparation	mile	70	700.0	105	1,050.0	92	920.4
Lake improvement	acre	240	180.0	320	240.0	300	225.0
Sub-totals			1,278.8		1,929.7		1,728.9
Planning							
Fish stream surveys	mile	1,100	34.0	Not available		Not available	
Fish lake surveys	acre	2,980	24.0	Not available		Not available	
Sub-total			58.0				
Total			1,336.8				

Measure	Unit	Non-Federal 1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement							
Stream	mile	586)	7,718	2,098)	6,502	3,142)	8,692
Lake	acre	10,315)		32,870)		33,671)	
Fish lakes	acre	873	1,311	1,850	2,877	2,330	3,596
Totals			9,029		9,379		12,288

to the maximum. No estimates have been made of the maximum man-days use the above groups could support at present population levels.

The Washington portion of Subregion 10 contains some lakes and nearly 3,500 miles of riverbanks and streambanks exterior to Federally-owned or -controlled properties. Pedestrian easements, boat launching sites, and parking areas are needed at many locations to help satisfy future angling needs. The immediate need for such access improvements is along the major steelhead streams. Additional angler access should also be provided at many lakes and streams, not only to increase angling for underutilized stocks of fish, but to provide more places where artificially propagated game fish could be utilized. Public access to saltwater areas should also be improved. A partial list of needed access areas follows:

Lakes

Ozette
Beaver
Elk
Undi
Wentworth
Aberdeen
Failox
Damon
Oyehut
Cranberry
Offut
Plummer

Rivers

Black River - boat launching and parking areas every 5 miles downstream from present access
Skookumchuck River - streambank access in upper river and boat launching and parking areas every 5 miles downstream from Bloody Run Creek
Chehalis River - boat launching and parking area near Independence

Saltwater

Willapa Bay
Grays Harbor
Juan De Fuca Strait near mouth of Pysht River (between Slip Point and Pillar Point)

Providing public access to salt water helps satisfy the growing angler demand. (Oregon State Game Commission)

The Oregon portion of Subregion 10 has access problems very similar to the Washington portion. These needs are outlined by watershed in the Oregon State Game Commission's "Master Plan for Angler Access and Associated Recreational Uses."

Augmentation of Supply

Anadromous and resident salmonids required to satisfy future needs will increasingly depend upon artificial propagation. The Washington Department of Game estimates that by 1980, it should double the production and release of legal-size rainbow trout; at least double the winter run steelhead smolt program; increase the searun cutthroat and summer run steelhead smolt releases 5-fold; and increase high lake rainbow fingerling plants by half. Similar accelerated programs are anticipated by the Washington Department of Fisheries, Fish Commission of Oregon, and Oregon State Game Commission.

Increased production of salmonids at existing hatcheries could be accomplished by expansion of structural facilities, water reuse, water quality control, improved feeds, disease control, and automation. Subregion 10 has numerous potential sites where hatcheries could be constructed to help provide future needs.

Artificial propagation of anadromous fish will involve an increased use of rearing ponds. The following locations[1/] have potential for pond construction and many of these sites should be developed by 1980. Additional sites will need to be located for construction by 2000. Production at the 1980 sites is limited in some cases by water quality problems that would need to be solved before work begins.

Washington
- Skookumchuck River area
- Chehalis River area
- Newaukum River area
- Bogachiel Rearing Pond (increase production)
- Naselle River
- Humptulips River
- Wynoochee River

Oregon
- Netarts Bay
- Cedar Creek
- North Umpqua River (river mile 30)
- Little River (Umpqua River tributary) (river mile 17)
- Steamboat Creek (Umpqua River tributary) (river mile 14)
- South Umpqua River (river mile 94)
- Providence Creek (river mile 4)
- North Fork Smith River (river mile 20)
- Randolph Slough (Coquille River) (river mile 6)
- Hughes Slough (Coos Bay) (river mile 10)
- South Slough (Coos Bay) (river mile 5)
- Davis Slough (Coos Bay) (river mile 15)

Hunting

Subregion 10 will need to support an additional 1,167,000 hunter-days by 2020. This goal can be reached only through an extensive program of habitat preservation to maintain present numbers of animals and provide a base for increasing future production through habitat improvement. This program is also needed to assure the public a place to hunt. Water resource development will offer few, if any, opportunities to provide additional hunting and will continue to reduce the amount of wildlife habitat in the subregion. Comprehensive planning is essential if wildlife numbers are to be maintained at favorable levels in the future.

1/ In addition to various potential "fishing lakes" listed in "Habitat Improvement" section.

Habitat Preservation

On the eastern slope of the Coast Range, critical big game lands lie between 200 and 1,000 feet elevation. On the western slope of this range, critical winter lands lie between sea level and 800 feet in elevation. If big game herds are to be retained at current abundance in the subregion, all lands within these critical elevational stratums will require protection from competitive developments and need compatible incorporation of habitat preservation measures into normal land use programs.

Numerous opportunities exist for multipurpose planning to provide habitat preservation. Flood plain zoning and green belt planning have long been advocated by various groups to prevent unwarranted development of highly productive lands. These proposals would prevent indiscriminate construction of industries, highways, and urban areas, which have little or no need for rich soil. Once reserved by zoning, these lands could withstand occasional flooding and continue to provide agricultural crops and wildlife, plus open space and various recreational uses. This action could help preserve additional habitat by eliminating or minimizing flood control measures in upstream areas. Zoning could also be used outside flood plains to prevent loss of key habitat by highway construction, dredging, land filling, and farming practices.

Following is a list of estuarine, wetland, and water areas of moderate to high value to waterfowl and other birds and mammals (total area involves 70,000 to 100,000 acres). Some of these locations are very productive hunting sites. These areas should be given high priority for further study and preservation in any far-reaching plan to maintain and improve water-oriented environment and wildlife resources thereof. Suggestions concerning the estuaries listed in the "Fish" section of this appendix are generally applicable for wildlife.

- Washington
  - Clallam County
    - Mukkaw Bay and lowlands
    - Waatch River lowlands
    - Sooes River lowlands
  - Grays Harbor County
    - Grays Harbor and some adjacent lowlands
    - Elk River bottoms
    - Governors Island
    - Lower Chehalis River and Preacher Slough area
  - Lewis County
    - Lincoln Creek bottoms from upper drainage downstream to vicinity of Centralia
    - Dillengaugh Creek bottoms southeast of Chehalis
    - Stearns Creek bottoms

Salmon Creek bottoms
Curtis-Boistfort area (pigeon area)
Pigeon Springs (South Fork Newaukum River)
Pacific County
Columbia River bottoms
Willapa Bay and certain perimeter lands
Palix River tidelands
Naselle River tidelands
Willapa River (pigeon site)
Wahkiakum County
Grays Bay
Altonna Bluff (band-tailed pigeon area)

Oregon
Columbia County
Westport Slough and certain perimeter lands
Clatsop County
Columbia River bottoms (all)
Tillamook County
Nestucca Bay
Sand Lake
Netarts Bay
Tillamook Bay
Nehalem Bay
Lincoln County
Alsea Bay
Yaquina Bay
Siletz Bay
Salmon River estuary
Lane County
Siltcoos Lake and adjacent lowlands
Siuslaw River bottoms from Tiernan downstream to mouth
Douglas County
Tenmile Lake tributaries
Eel Lake tributaries
Clear Lake
Umpqua River and contiguous lowlands from U. S. Highway 101 bridge to Pacific Ocean
Smith River from mouth upstream 3 miles
Tahkenitch Lake and nearby lakes and certain perimeter lands
Siltcoos Lake and adjacent lowlands
Coos County
New Lake and associated marsh north to and including Crooks Lake
Coquille River flood plain from mouth of South Fork downstream to Pacific Ocean
Coos Bay estuary and tributaries

Marsh and lake area west of U. S. Highway 101 from Coos Bay north to Tenmile Creek
Tenmile Lake tributaries

Curry County
- Lobster Creek bottoms (Rogue River tributary)
- Garrison Lake
- Elk River - coastal marsh area south of mouth
- Sixes River - coastal marsh area south of river in T. 32 S.
- Floras Lake and certain perimeter lands
- Marsh lake areas from Floras Lake north to New Lake on county line

Josephine County
- Deer Creek lowlands from mouth to a point about 15 miles upstream

Habitat Improvement

The high percentage of private land in the subregion is a major problem affecting habitat improvement. Landowners are reluctant to withdraw land from production, and leases and/or acquisition of land increases costs substantially. A zoning program as discussed under "Habitat Preservation" would not only preserve habitat, but provide areas where habitat improvement could take place. The integration of wildlife habitat improvement programs (i.e., special timber cutting cycles, fertilization, burning, and farmland food patch development) into private land use programs would produce significant results, but incentives to landholders would be necessary to actuate a meaningful program.

It is recognized that habitat improvement, based on current technology, will not be capable of meeting the forecast demand for big game in Washington. Therefore, improvement measures will also include the reclaiming of historic ranges, where big game is currently excluded, and seeking more compatible winter use of ranges where such use is restricted. Big game ranges can be upgraded by utilizing some of the following techniques:

(1) Reduce vegetative competition by burning, use of herbicides, and scarification.

(2) Harvest timber at closer intervals, thin dense stands, and revegetate spur roads.

(3) Farm browse intensely on key ranges by using plant genetics, fertilization, cultivation, and irrigation.

(4) Prevent encroachment of competitive developments on wildlife space.

(5) Coordinate range livestock grazing patterns to fit wildlife needs.

(6) Employ mechanical devices for manipulation of game, such as fencing, Dutch mirrors, and canal and highway ramps.

(7) Eliminate nuisance and harassment factors which affect wildlife abundance on critical winter, breeding, and calving/fawning areas, such as overdevelopment of recreational facilities, overuse by people, noise, excessive roads, and off-road vehicles.

Revegetating wildlife areas with desirable cover and food species is a principal opportunity for habitat improvement. Big game depends upon habitat below 1,000 feet elevation in this subregion during the winter, especially where there is an abundance of low-growing vegetation for food and adequate protective cover. This type of habitat is of poorest quality in old growth timber, dense second growth, and brush areas where low vegetation is sparse. Consequently, logged and burned areas generally contain the most productive winter range. Specific measures to increase and improve deer and elk range could involve modifying timber harvest programs so that high quality habitat would be produced on a sustained basis. Cutting quotas would not have to be changed, but other problems could occur. Some types of vegetation could be removed by controlled burning or other measures and benefit not only wildlife but the timber industry as well by promoting regrowth of timber.

It is obvious that intense habitat improvement must be accomplished on lands owned or controlled by public agencies. These lands must also be key wildlife lands with inherent capabilities for producing much more wildlife than they are producing at the present time if future demands are to be met. Generally, these high potential lands fall within the areas designated under "Habitat Preservation." The following Washington areas have key qualifications for wildlife development and should be acquired primarily for this purpose:

Big game lands in the Wynoochee and Hoquiam River drainages in Grays Harbor County (additions to Olympic Wildlife-Recreation Area).

Bottomlands in Johns River area of Grays Harbor County (addition to Johns River Wildlife-Recreation Area).

Big Hanaford area of Lewis County for upland birds and waterfowl.

Portions of the North Fork Newaukum River bottoms for upland birds.

Pleasant Valley area of Lewis County for upland birds.

Scatter Creek area lands of Thurston County (addition to Scatter Creek Wildlife-Recreation Area for upland birds).

Upland bird areas near Rochester in Thurston County.

Black River bottomlands in Thurston County for upland birds and waterfowl.

Similar areas need to be identified in Oregon.

Publicly financed irrigation or flood control projects should not only compensate for wildlife losses, but should also provide wildlife enhancement. This could be accomplished by designating certain project lands or features (such as canals) to be held permanently in public ownership and improved specifically for wildlife purposes. Management of these lands would vary with species involved, but upland game and waterfowl areas would probably require an assured water supply for irrigation and ponds, to obtain maximum production.

Preliminary estimates by the Oregon State Game Commission indicate a need for habitat improvement measures including 225 miles of fence, 200,000 acres of habitat manipulation, acquisition of 32,000 acres of wildlife lands, and development of about 200 waterholes or guzzlers. Similar measures are needed in the Washington portion of the subregion.

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are included in table 77.

Greater Harvest

Black-tailed deer, forest grouse, and some marine waterfowl could withstand significant increased hunting pressure. These potentials are related to specific areas, and special studies are needed to determine the amount of hunting available and the measures, such as special hunts or improved public access, needed to realize this potential.

Augmentation of Supply

Satisfying future hunting needs will require a number of programs to increase the amount of wildlife on accessible hunting areas.

Table 77 - Wildlife Habitat Improvement Means, Subregion 10

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Seeding and planting	acre	5,020	502.0	6,530	653.0	6,530	653.0
Forage release & prescribed burning	acre	11,600	26.0	6,800	26.0	1,200	18.5
Key area fencing	mile	50	50.0	70	70.0	60	60.0
Permanent openings	acre	230	23.0	300	30.0	290	29.0
Wildlife food crops	acre	700	18.9	4,600	89.7	7,200	140.4
Guzzlers	each	10	10.0	30	30.0	20	20.0
Shallow impoundments and marsh improvements	acre	70	53.0	110	83.0	100	75.0
Develop potholes	each	20	1.0	40	2.0	30	2.0
Develop nesting facilities	each	240	12.0	340	17.0	320	16.0
Sub-totals			695.9		1,000.7		1,013.9
Planning							
Big game range analysis	acre	1,866,300	187.0	Not available		Not available	
Upland game habitat surveys	acre	1,700,000	85.0	Not available		Not available	
Habitat management plans	each	59	30.0	Not available		Not available	
Sub-total			302.0				
Total			997.9				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement1/	acre	56,000	697	94,000	1,635	218,000	4,822
Land acquisition2/	acre	31,000	11,550	27,000	7,857	35,000	10,523
Fencing3/	mile	55	59	79	232	142	415
Water developments4/	each	25	30	70	67	85	84
Totals			12,336		9,791		15,844

1/ Includes cover plots, food patches, marsh development, nest structures, etc.
2/ Obtained by fee purchase and easement rights.
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land, and to protect key wildlife habitat.
4/ Water developments consist primarily of guzzler installations and spring development (including fencing).

Artificial propagation of upland game, especially pheasant, will become more extensive. Introduction of exotic species may also be involved if research reveals species that will adapt to local conditions and not conflict with other wildlife and domestic animals. Transplanting native species is also a possibility if local problems can be solved. In this respect, an ongoing program is underway to establish several new elk herds in the Oregon portion of the subregion.

The State of Washington anticipates that artificial feeding of game will probably become a necessary future management tool if demands for wildlife are to be met. Such feeding would substitute for range deficiencies during short term critical periods--if and when such ranges are lost to competitive uses. Studies are needed to determine the ultimate benefits of artificially providing interim subsistence to wildlife.

LOCATION MAP

SUBREGION 11

SUBREGION 11, PUGET SOUND

GENERAL DESCRIPTION OF SUBREGION

The Puget Sound Subregion is an area of about 13,355 square miles in northwestern Washington. It consists of the watersheds of all Washington streams draining into Puget Sound, and islands and waters of the United States in Puget Sound, east of the west edge of the Elwha River watershed. Puget Sound, with its many islands, bays, channels, and tributary streams, and the massive mountains of the North Cascade Range are the dominant physical features of this subregion.

Principal streams are Nooksack, Samish, Skagit, Stillaguamish, Snohomish, Skykomish, Snoqualmie, Cedar, Green, Puyallup, Nisqually, Deschutes, Skokomish, Hamma Hamma, Duckabush, Dosewallips, Union, Tahuya, Dewatto, Dungeness, and Elwha Rivers. Several streams are fed by glacial melt water and are discolored during the summers. The lowlands contain several large lakes including Lake Whatcom (5,003 acres), Lake Washington (22,138 acres), and Lake Sammamish (4,897 acres), as well as many smaller lakes. Small lakes dot the mountainous area. A number of reservoirs have been constructed, mostly for hydroelectric power production and municipal-industrial water supply.

This subregion is heavily timbered except for high alpine areas, salt meadows, and areas that have been cleared for agriculture, housing, or industry. Most of the timber has been cut from the low-lying area and the lower mountain slope. Much of this cut-over area is now in second growth conifers and brush.

Elevations in the subregion range from sea level to 14,410 feet at the top of Mount Rainier.

The subregion in general has a humid, mild climate, but precipitation ranges from very high in parts of the Olympic Mountains and Cascade Range to very low on some of the islands in the Sound and at points along the east side of the Olympic Peninsula. Temperatures also vary. There are a number of active glaciers at high elevations, and at some points in the Cascades freezing temperatures may occur any day of the year.

Much of the lowland around the Sound has been cleared and is used for dairying, livestock, or crop production. Principal crops are market vegetables, vegetable seeds, and hay. A relatively small percentage of the farmed area is irrigated.

The human population, 1,904,100, is concentrated in a narrow strip along the Sound, principally in the Everett-Seattle-Tacoma area, and in the principal river valleys. The mountainous area has a very low population.

HISTORY OF FISH AND WILDLIFE

The history of this subregion is generally similar to that of other subregions west of the Cascade Range, but varies in detail and species of fish and wildlife involved. The large Indian population declined with the coming of the settlers. Most fish and wildlife resources remained underexploited for many years thereafter. The oyster industry boomed early in the last half of the last century, then declined to boom again after tidelands came under private ownership and railroad transportation expanded markets and enabled Atlantic oyster seed to be imported.

The fishing industry began with a small pack of coho salmon in 1877, but did not really get started until after the first transcontinental railroad reached the Sound in 1887. The largest pack was in 1917 when 45 canneries packed nearly two million cases.

There had been limited cutting of timber around the Sound until the railroads arrived in the Pacific Northwest. At the turn of the century, large scale cutting of the virgin forests began. This adversely affected anadromous fish runs because splash and roll dams were established on practically all streams to facilitate movement of logs downstream to the mills. The dams blocked runs. Erosion from denuded slopes and wash from the dams destroyed spawning beds.

The rush to the Alaska gold field, the coming of the railroads, the salmon and oyster booms, all led to rapid increases in human population of the area. This in turn led to the establishment of new industries, increased pollution, filling of tidelands, diking, construction of dams for municipal-industrial water supply and hydropower, dredging, channeling, and other factors adverse to the survival of fish and wildlife.

Laws were enacted to protect the resources; refuges and reserves were established. Hatcheries and egg-taking stations were constructed on many streams of the subregion. Some of these were instrumental in destroying the very runs they were planned to perpetuate.

In more recent years programs to restore and perpetuate the renewable resources so poorly managed in the past have resulted from several factors. The technology of game and fish management

and propagation has advanced. The general public has become aware of the evils of single-purpose, destructive exploitation of natural resources. Also, the political atmosphere is favorable for the preservation of natural beauty, and the conservation of natural resources.

Intensive fishery management has succeeded in maintaining populations of anadromous fish in most subregion streams, but habitat destruction and heavy fishing pressure have seriously depleted populations of resident salmonids. Warmwater and nongame fish have increased in many areas. The annual harvest of most wildlife has remained relatively stable during recent years.

PRESENT STATUS

The groups of fish and wildlife are anadromous, resident, and marine fish, shellfish, big game, upland game, fur animals, waterfowl, and other wildlife.

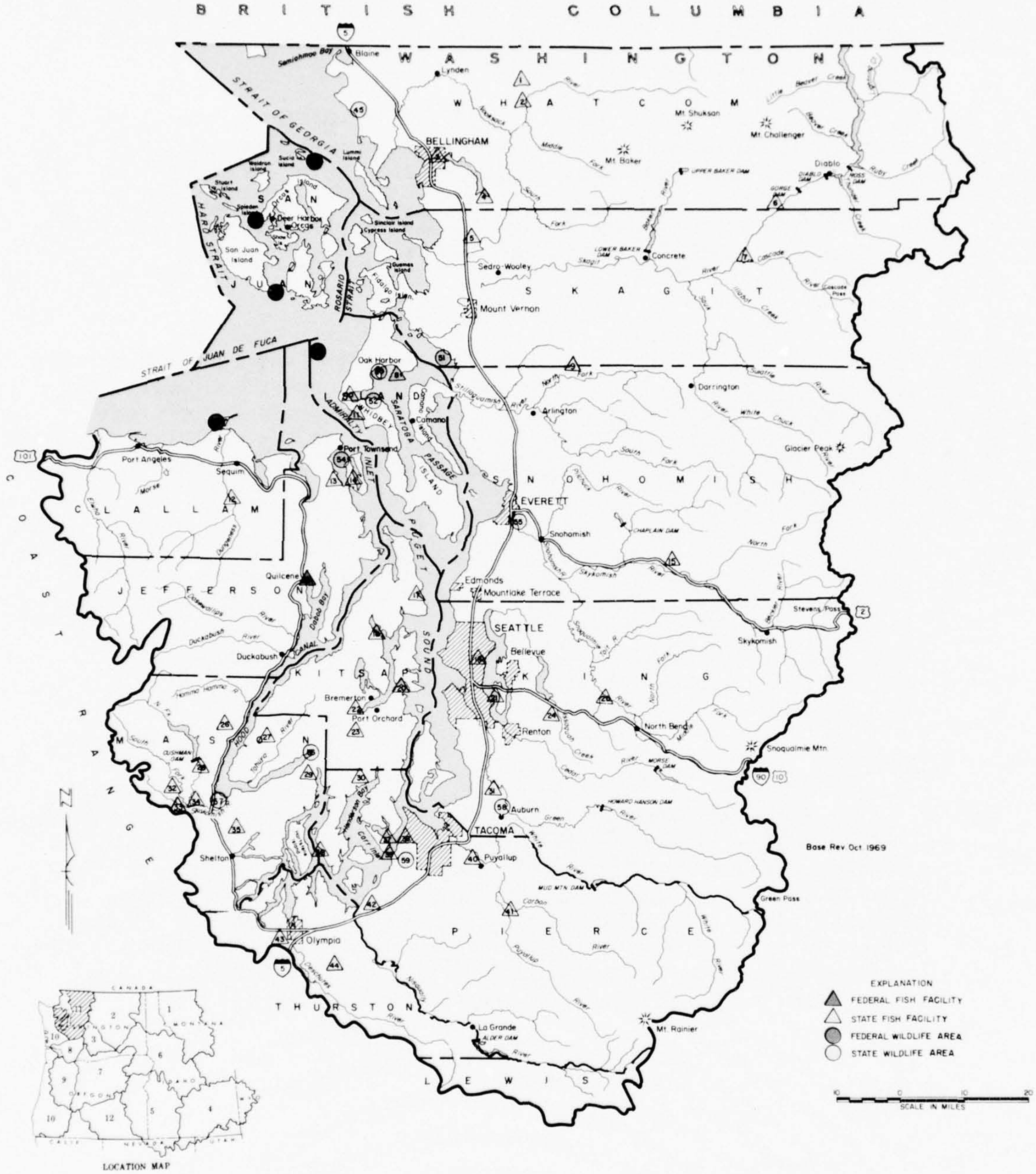
Fish and wildlife resources are of major economic and recreational importance. The 1965 commercial harvest of marine fish and shellfish amounted to about 80,400,000 pounds with a value to the fishermen of about $7,800,000.

Pink salmon is one of the food fish harvested from Puget Sound. (Washington Department of Fisheries)

FIGURE 36. EXPLANATION

Symbol No.	Name	Area or Fish Production - 1965 Acres	Pounds
1	Sprague Pond Rearing Area	12	605,000 1/
2	Nooksack Hatchery		49,009
3	Bellingham Hatchery		56,170
4	Lake Whatcom Hatchery		1,016
5	Samish Hatchery		29,238
6	Newhalem Pond Rearing Area	23	173,300 1/
7	Skagit Hatchery		31,369
8	Maylor Lagoon Rearing Area	4 to 30	373,600 1/
9	Arlington Hatchery		37,739
10	Kennedy Lagoon Rearing Area	11	393,500 1/
11	Crockett Lake Rearing Area	300	880,500 1/
12	Dungeness Hatchery		47,136
13	Anderson Lake Rearing Area	56	125,200 1/
14	Raabs Lagoon Rearing Area	9	272,400 1/
15	Skykomish Hatchery		38,805
16	Quilcene National Fish Hatchery		40,000
17	Kingston Lagoon Rearing Area	18	320,900 1/
18	Keyport Lagoon Rearing Area	22	853,000 1/
19	University of Washington Hatchery	.5	
20	Little Clam Bay Rearing Area	27	332,300 1/
21	Seward Park Hatchery		39,831
22	Alexander Lake Rearing Area	20	99,500 1/
23	Heins Lake Rearing Area	6	23,000 1/
24	Issaquah Hatchery		55,973
25	Tokul Creek Hatchery		31,066
26	Melbourne Lake Rearing Area	35	250,600 1/
27	Erdman Lake Rearing Area	20	99,900 1/
28	Hood Canal Hatchery		41,883
29	Prickett Lake Rearing Area	80	487,900 1/
30	Minter Creek Hatchery		42,583
31	Green River Hatchery		80,853
32	West Lake Rearing Area	54	141,391 1/
33	Shelton Hatchery		65,636
34	George Adams Hatchery		33,610
35	Cranberry Lake Rearing Area	171	
36	Whiteman's Cove Rearing Area	27	1,669,900 1/
37	Titlow Lagoon Rearing Area	4	192,500 1/
38	Titlow Pond Rearing Area	1	40,300 1/
39	South Tacoma Hatchery		81,817
40	Puyallup Hatchery		73,777
41	Puyallup Hatchery		20,867
42	Sequallitchew Lake Rearing Area	90	472,900 1/
43	Capitol Lake Rearing Area	332	2,644,368 1/
44	Silver Springs Rearing Area	4	2,077,000 1/
45	Lake Terrell Wildlife-Recreation Area	926	
46	Matia Island National Wildlife Refuge	145	
47	Jones Island National Wildlife Refuge	188	
48	San Juan National Wildlife Refuge	55 2/	
49	Smith Island National Wildlife Refuge	65	
50	Oak Harbor Wildlife-Recreation Area	579	
51	Skagit Wildlife-Recreation Area	12,192	
52	Whidbey Island Game Farm	180	
53	Dungeness National Wildlife Refuge	556	
54	Marrowstone Island Wildlife-Recreation Area	16	
55	Ebey Island Wildlife-Recreation Area	421	
56	Union River Wildlife-Recreation Area	9	
57	Skokomish River Tidelands Wildlife-Recreation Area	105	
58	Auburn Game Farm	156	
59	South Tacoma Game Farm	80	

1/ Numbers of fish.
2/ Composed of 6 widely separated units.



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES DEVOTED TO FISH AND WILDLIFE

PUGET SOUND SUBREGION 11

1970

FIGURE 36

Expenditures associated with recreational use of fish and wildlife amounted to about $30,000,000. These activities provided about 5,587,000 man-days of recreation.

Many factors affect the fish and wildlife resources of the subregion, but the most pronounced are man's activities that drastically alter fish and wildlife habitat.

Figure 36 locates and identifies major State and Federal fish and wildlife lands and facilities.

Anadromous Fish

The Puget Sound Subregion is of major importance in the production and harvest of salmon and steelhead trout. However, the commercial and sport fisheries involve fish produced in other subregions. Because of this intermingling of regional fish stocks, a regional analysis of the present status is presented in the "Regional Summary."

Resident Fish

Freshwater game species include rainbow, cutthroat, and brook trouts, Dolly Varden, mountain whitefish, kokanee, largemouth bass, bluegill, black crappie, brown bullhead, and yellow perch. Nongame fish include squawfish, carp, chub, sucker, sculpin, and stickleback.

Habitat

Resident salmonids are found in rivers and lakes from sea level to more than 5,000 feet elevation. Highest quality habitat for these species are waters having low temperatures and little pollution. Lower reaches of most of the major streams do not support resident salmonid populations. Warmwater game and nongame fish are mostly found at lower elevations where their distribution may overlap that of salmonids. These species are more tolerant of high water temperatures and poorer water quality than salmonids.

The subregion contains about 2,700 lakes and reservoirs with a total surface area of approximately 116,000 acres. Major reservoirs included in this total are:

Reservoir	Surface Acres
Baker Lake	3,616
Shannon Lake	2,148
Ross Lake	11,678
Diablo Lake	910

Reservoir	Surface Acres
Chester Morse Lake	1,682
Lake Spada	1,527
Howard Hanson	2,240
Mud Mountain	1,200
Alder Lake	2,931
Lake Cushman	4,003

An estimated 230 farm ponds are managed for fish production.

Use

Sport fishing for resident fish was about 3,510,000 man-days in 1965. Table 78 shows how this use was divided between two kinds of waters. Most of the fishing was by residents of the subregion.

Table 78 - Estimated Sport Fishing Use of Resident Fish, Subregion 11, 1965

Waters	Angler-Days
Streams	953,100
Lakes, Ponds, and Reservoirs	2,556,700
Total	3,509,800

Source: Puget Sound and Adjacent Waters Comprehensive Water and Related Land Resources Study Report, Appendix XI, Fish and Wildlife, March 1970.

Angling for resident fish is one of the major recreation outlets for inhabitants of the subregion, and is of considerable economic significance. Expenditures by sport fishermen were approximately $19,000,000 in 1965.

Natural production of resident salmonids is not sufficient to supply present sport fishery needs. Hatchery fish make up the deficit. Some additional angling potential for naturally produced salmonids exists, but this potential is mostly in scattered inaccessible waters. Warmwater species could sustain a significant increase in use, but are not as popular for sport as trout.

Lakes in the subregion afford prime trout angling. (Washington Department of Game)

Factors Affecting Resource

Resident fish are subjected to a variety of limiting factors. Many miles of streams and numerous lakes have been drastically altered by man's activities and demands for water. Impoundments, channeling, pollution, indiscriminate use of herbicides and pesticides, water withdrawal, logging, farming, and mining have drastically reduced area and quality of salmonid habitat. Warmwater and nongame fish are less influenced by limiting factors, although low water temperatures and related factors restrict their range in many areas.

The major beneficial activities influencing resident game fish include pollution control, dam construction, control of nongame fish, screening of diversions, provision of passage at barriers, regulation of harvest, and artificial propagation.

The major factor limiting use of resident game fish is restricted access on some private and municipal lands. Large areas in the Tolt, Cedar, and Sultan River watersheds are withheld from public use as municipal water supplies. Improved access is provided at special fishing access areas acquired and developed by the Washington Department of Game. The Department operates 10 fish

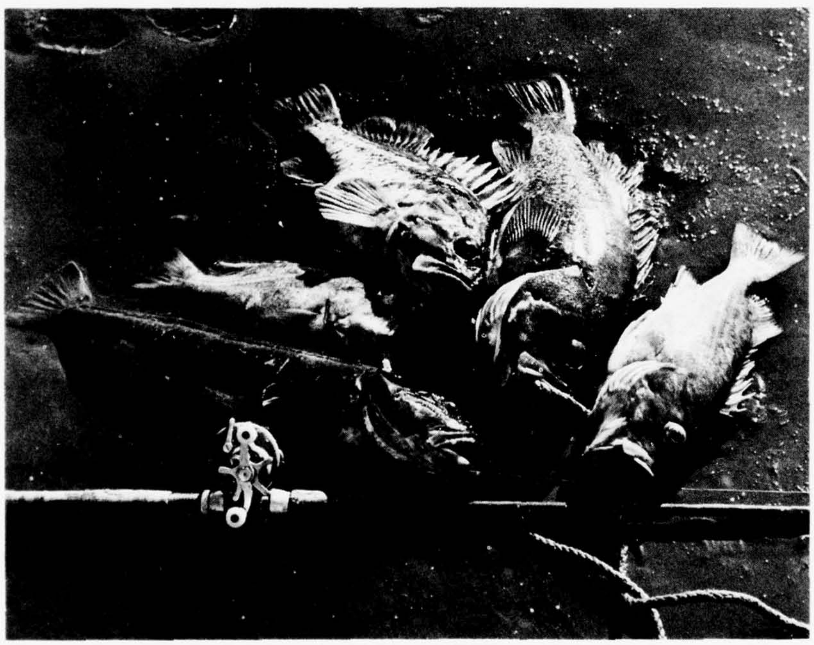
hatcheries in the subregion and there are several small private hatcheries and fee-fishing areas.

Marine Fish and Shellfish

Marine fish include lingcod, starry flounder, Pacific herring, halibut, surf smelt, and rockfish. Major species of shellfish found in marine and estuarine areas are Pacific and Olympic oysters; littleneck, horse, jackknife, butter, softshell, and geoduck clams; scallop; shrimp; octopus; squid; and Dungeness crab.

Habitat

A vast area of Puget Sound lies between high and low tide lines. This, coupled with the constant admixture of nutrients carried by its tributary streams, makes the waters very fertile and capable of producing vast quantities of fish and shellfish. Production of many species is, however, below potential because pollution and siltation have degraded habitat.



Marine fish angling in Puget Sound is productive. (Washington Department of Fisheries)

Use

Marine fish and shellfish are harvested for commercial and recreational purposes. The estimated 1965 commercial harvest was

73,610,000[1/] pounds of marine fish, and 6,756,800 pounds of shellfish. It is estimated that the 1965 recreational use amounted to 73,000 man-days for marine fish and 121,000 man-days for shellfish. Some species of marine fish and shellfish could withstand greater harvest.

Commercially harvested marine fish and shellfish had a 1965 value of about $6,600,000 and $1,200,000, respectively. Expenditures associated with recreational use amounted to an estimated $364,000 for marine angling and $603,000 for shellfish.

Factors Affecting Resource

Principal limiting factors are pollution and habitat destruction resulting from urban and industrial development and natural causes such as beach erosion.

Impact of waterfront development adversely affects various marine fish and shellfish. (Washington Department of Game)

1/ Includes landings from open ocean, thus differs from figure of 20,475,000 lbs. in Puget Sound and Adjacent Waters Comprehensive Water and Related Land Resources Study Report, Appendix XI, Fish and Wildlife, March 1970.

The resource benefits from pollution control, habitat protection at marine parks, regulation of fishing methods, size and catch, and inaccessibility of much of the habitat which discourages development for other purposes.

Recreational use is affected by private ownership (including much non-commercial) of large areas of shellfish habitat. Access to some publicly-owned areas is by boat only, and this limits use of the resource.

Big Game

Black-tailed deer, Roosevelt and Rocky Mountain elk, black bear, mountain goat, and mountain lion are the principal big game of the subregion.

With the general exception of urban and barren alpine areas, the entire subregion is inhabited by one or more species of big game. The greatest numbers of animals are found in the foothills and mountains.

Habitat

Highest quality habitat for deer, elk, and bear is found in logged areas and burns where dense brush and closed-canopy timber have been removed and forage and browse are most abundant. Such areas support major populations of these animals. Lesser numbers are found in areas of dense timber and brush, steep terrain, and farm areas. Wintering areas for deer and elk are not critically defined but are usually located below the snowline near elevations of 1,500 to 2,000 feet. Mountain goat and mountain lion are generally found in more remote areas.

Use

Hunting effort amounts to about 363,000 man-days annually. An analysis of this use is presented in table 79.

Much of the bear hunting and harvest is incidental to deer and elk hunting, and goat hunting is closely regulated on a permit basis. Most of the hunting pressure is provided by inhabitants of the subregion.

Big game provided about 43 percent of the hunting in the subregion in 1965. Expenditures associated with this hunting are estimated to have exceeded $3,400,000.

Deer and bear could support a greater harvest, but much of the potential exists in areas that are inaccessible, or closed

to public access. Elk, mountain goat, and mountain lion are harvested to near maximum.

Table 79 - Estimated Hunting Use of Big Game, Subregion 11, 1965 1/

Species	Hunter-Days
Deer	321,000
Elk	18,800
Bear	20,600
Mountain Goat	1,500
Mountain Lion	800
Total	362,700

1/ Estimates based on data from Puget Sound and Adjacent Waters Comprehensive Water and Related Land Resources Study Report, Appendix XI, Fish and Wildlife, March 1970.

Factors Affecting Resource

Water development projects have destroyed important wintering habitat in a number of watersheds. Projects under construction are continuing to destroy individual tracts of habitat of value to big game, especially deer.

Quality of deer and elk habitat has declined in areas where logging has decreased. More efficient fire prevention and control methods have limited the amount of high-quality range developed by wildfire. Urban and industrial expansion, highway construction, and many other activities destroy habitat of value to big game.

Deer, elk, and bear are benefited by timber harvesting and fire which remove closed-canopy timber and facilitate growth of browse and forage. Early cutting of regrowth for pulp mills helps maintain excellent habitat in some areas.

Hunting is affected by a number of factors, but especially access. Some areas are closed, including several large municipal watersheds, but most other public lands and a number of private tree farms and timber tracts are open to hunting.

Upland Game

Principal upland game of this subregion include ring-necked pheasant, valley and mountain quail, blue and ruffed grouse, mourning dove, band-tailed pigeon, cottontail, and snowshoe rabbit.

Habitat

Ring-necked pheasant, valley quail, and mourning dove are present in greatest numbers in grain production areas adjacent to brushy fence rows and other forms of cover in farming areas. Lesser numbers are found throughout the remaining lowland agricultural areas. Cottontail are most abundant in the brushy tracts adjacent to agricultural lands. Ruffed and blue grouse, band-tailed pigeon, mountain quail, and snowshoe rabbit are primarily inhabitants of the foothills and mountains.

Use

Hunting effort amounted to about 277,000 man-days in 1965. Table 80 shows an analysis of this use by species. Most of the hunting pressure was by inhabitants of the subregion.

Table 80 - Estimated Hunting Use of Upland Game, Subregion 11, 1965[1/]

Species	Hunter-Days
Pheasant	57,000
Quail	5,000
Grouse	93,000
Mourning Dove	2,000
Band-tailed Pigeon	72,000
Rabbit	48,000
Total	277,000

1/ Estimates based on data from Puget Sound and Adjacent Waters Comprehensive Water and Related Land Resources Study Report, Appendix XI, Fish and Wildlife, March 1970.

Upland game provided about 32 percent of the hunting in the subregion in 1965. The resource offers many opportunities for hunting, and hunter expenditures in 1965 amounted to about $1,300,000.

Grouse, rabbit, dove, and perhaps quail, could sustain some increase in harvest.

Factors Affecting Resource

Water development has had varied effects on upland game. Impoundments and streambank clearance have destroyed considerable habitat. Flood control and drainage have made it possible to convert

tracts of uncultivated lands into homesites or crop production with a resultant loss of habitat. Irrigation has increased specialty crops and pasture in some grain production areas and thereby reduced the amount of food available for upland game.

Many other activities are detrimental to upland game. Highway construction, industrial development, and urban expansion have destroyed large areas of habitat. Farming methods involving field burning, spraying, and clean farming have reduced food, cover, and game numbers.

The upland game resource benefits from management of seven State wildlife areas in the subregion. In addition, the Washington Department of Game operates three game farms and conducts a habitat development program. Some farmers have a personal interest in upland game and leave scattered patches of food and cover on their lands for wildlife use. Several State and Federal organizations encourage and assist landowners to develop food, water, and cover for upland game and other wildlife.

The major factor affecting hunter use is access. Posting of private lands and inaccessibility of some good hunting areas reduce hunting opportunity. The Washington Department of Game is constantly seeking to improve landowner-sportsman relations and to obtain access privileges for the general public.

Fur Animals

Fur animals include beaver, muskrat, mink, river otter, raccoon, bobcat, coyote, marten, red fox, opossum, skunk, weasel, and fisher. Fur animals are found throughout the entire subregion.

Habitat

Beaver, muskrat, mink, raccoon, and river otter occur around water throughout the subregion. Red fox, opossum, and skunk inhabit lowland areas. Bobcat and coyote are inhabitants of foothill and mountain areas. Marten and fisher are found at high elevations along the Cascade crest.

Use

Approximately 17,000 animals were trapped during the 1965-66 season. Muskrat pelts made up about 65 percent of the total harvest. The remaining 35 percent were mostly beaver, raccoon, and mink. Harvest of some species could be greater, but much of the increase would consist of low value pelts.

Pelts trapped in the subregion during the 1965-66 season had a value of more than $85,000.

Factors Affecting Resource

Water development is usually detrimental to the fur resource. Impoundments, drainage, and channelization destroy valuable habitat that is seldom replaced. Urban and industrial expansion also conflicts with the resource.

Development of waterfowl habitat by State, Federal, and some private groups has resulted in incidental benefits to fur animals.

Resource use is influenced most by fur values, and trappers expend most of their effort on species from which the greatest return can be realized.

Waterfowl

Puget Sound Subregion has a combination of water, marsh, and cropland that attracts large numbers of waterfowl. More than 20 species of ducks, black brant, snow goose, and several races of Canada goose are common.

Waterfowl are primarily migratory inhabitants during their spring and fall flights to and from northern nesting areas. However, the study area supports large numbers of wintering waterfowl, including one of the largest populations of wintering snow goose on the Pacific Coast. Several species of ducks nest in the subregion.

Snow geese and other waterfowl winter in subregion waters. (Bureau of Sport Fisheries and Wildlife)

Habitat

Highest quality habitat consists of tidelands, marshes, and agricultural lands of and adjacent to Puget Sound. Large areas of open water serve as resting habitat for waterfowl. Eelgrass beds of the subregion are extremely important to black brant of the Pacific Flyway. Lakes and reservoirs in the foothills and mountains provide resting and nesting habitat for small numbers of waterfowl.

Use

Waterfowl hunting use in 1965 was about 208,000 man-days. Table 81 shows how this use was divided between hunting ducks and geese. Nearly all of the hunting was by inhabitants of the subregion.

Table 81 - Estimated Hunting Use of Waterfowl, Subregion 11, 1965 1/

Waterfowl Group	Hunter-Days
Ducks	201,000
Geese	7,000
Total	208,000

1/ Estimates based on data from Puget Sound and Adjacent Waters Comprehensive Water and Related Land Resources Study Report, Appendix XI, Fish and Wildlife, March 1970.

Waterfowl provide approximately 24 percent of the total hunting in the subregion. An estimated 1965 expenditure of nearly $1,300,000 was attributable to waterfowl hunting in the subregion.

Several species of waterfowl could withstand greater hunting pressure and harvest. These are primarily diving and sea ducks which are more difficult to hunt and not as desirable to the hunter as pond duck, goose, and brant.

Factors Affecting Resource

Waterfowl numbers and habitat are affected by a variety of limiting factors. In this subregion, marsh and estuarine habitat is rapidly being converted to urban and industrial use. Dredging and filling, wetland drainage, diking, revetment, water pollution, and channeling reduce quality and quantity of waterfowl habitat.

The Washington Department of Game operates seven waterfowl management areas, the largest of which is Skagit Wildlife-Recreation Area. These are open to public hunting. The Bureau of Sport Fisheries and Wildlife operates five small wildlife refuges which receive some waterfowl use. Beneficial activities also include development and preservation of waterfowl habitat by private interests such as gun and conservation clubs and farmers.

Major factors affecting waterfowl hunting are water conditions, weather, and access. Low water levels early in the hunting season limit the amount of hunting area available, and this condition is aggravated by flood control and drainage in some areas. Weather plays an important role in waterfowl movements and hunting in the subregion. Mild weather often delays migration flights from the north and restricts early season hunting. Restricted access to private lands and gun clubs and "no shooting" ordinances in some rural areas reduce use of the resource. Public hunting is provided on Washington Department of Game's wildlife management areas. Public access to rivers, lakes, and impoundments permits hunters to reach many good hunting sites via boat.

Other Wildlife

Puget Sound Subregion supports many other species of wildlife, some of which are important because they are either injurious, are sought by sportsmen, or have a commercial value. Among the former are rats, mice, moles, starlings, and blackbirds that destroy foodstuffs or interfere with agricultural pursuits. Feral pigeon and a number of other species are sought for recreation. Many species of songbirds and waterbirds of esthetic importance are present and provide recreation for many people. Small numbers of bald eagle are also present. Four of the five national wildlife refuges in this subregion were established primarily for the protection of seabirds and waterbirds.

The many factors affecting big game, upland game, fur animals, and waterfowl also influence this group. Very few restrictions affect use of most species legally hunted, as bag limits are liberal, populations of many species are high, and distribution is widespread. Hunting for unprotected species amounted to about 10,000 man-days, 1 percent of the subregional total, in 1965. This could be increased significantly.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

The following "Means" are a summary of fish and wildlife input for the Comprehensive Study of Water and Related Land Resources, Puget Sound and Adjacent Waters. More specific information is available in the report of that study. Some variation of "needs" occurs because of major differences in human population projections made by the two studies (Type I and Type II).

Fishing

Subregion 11 will need to provide an additional 4,914,000 angler-days for resident fish, 102,000 angler-days for marine fish, and 169,000 man-days for shellfish by year 2020. In addition, subregion streams must provide a substantial portion of the anadromous fish needed to satisfy the Region's sport and commercial fisheries. Commercial harvest will require an additional 103,267,000 pounds of marine fish and 10,874,000 pounds of shellfish.

A variety of ongoing and proposed ecological programs will conserve and enhance fish and shellfish resources, but strong single-purpose measures will be needed to satisfy future demands. Fish and shellfish production must be raised and there are numerous opportunities for providing such increases within the subregion. The initial need is preservation of habitat, not only to prevent loss of current production, but to make it possible to increase production with habitat improvement on these areas. Natural production must be developed to the maximum, but artificial propagation, improved access for anglers, and other management programs will also be needed.

Habitat Preservation

Preservation of environment and maintenance of water quality suitable for continued production of fish and shellfish should be primary considerations. All of the remaining major river systems and many lesser tributaries of the Sound need to be retained in a free-flowing state to permit natural production of anadromous and resident fish. This does not, however, preclude development of water storage at upper watershed or off-channel sites where such storage can be used for resource enhancement via flow augmentation. Greater control of water development, gravel removal, dredging, logging, road building, and waste disposal is also essential in a program of habitat preservation.

Zoning is needed to prevent further intrusion of commercial and private development into fish and shellfish habitat. This is especially true in the estuarine areas of the subregion, many of which have been seriously reduced in size by construction of

facilities that are not water dependent. Comprehensive land and water use plans are needed for all estuaries to permit urban-industrial development and other uses only where they are compatible with fish and shellfish resources. Such a plan has been prepared for Yaquina Bay, Oregon, in Subregion 10. Zoning codes should also be implemented for river flood plains and lake shore and marine shoreline areas.

Habitat Improvement

A key habitat improvement requirement is the need to provide sufficient flow for fish transportation, spawning, and rearing in every existing or potential fish production stream. Detailed studies will be needed to determine flow levels necessary to achieve these conditions. The Fish and Wildlife Appendix, Puget Sound and Adjacent Waters Study report, March 1970, lists nearly 150 streams needing improved flows for fish enhancement. Low flow augmentation over an estimated 600 miles of subregion streams could provide a minimum production increase of 394,500 salmon annually.

Water quality improvement is needed in many streams and nearly all estuaries of the subregion. The most common pollution sources include sewage, domestic-industrial garbage, mill effluents, log storage, and petroleum residues. Additional information, particularly concerning thermal pollution and effects of combinations of pollutant materials in a specific habitat, is needed in many areas. The Fish and Wildlife Appendix (Puget Sound Study) lists more than 50 rivers and streams needing water quality improvement for fish.

Manmade and natural barriers on many streams prevent upstream migration of anadromous fish and prevent use of many miles of spawning habitat. The Fish and Wildlife Appendix (Puget Sound study, Type II) identified 35 streams blocked by dams and 58 streams blocked by waterfalls and cascades. It is estimated that fish production habitat upstream from these barriers could provide a minimum increase of 555,000 salmon annually. The Type II report proposes estimated capital expenditures of $3,159,000 to provide an additional 360,000 salmon annually by the year 1980, and $2,250,000 to provide an additional 195,000 salmon annually by 2000. Feasible projects would be completed by the year 2000.

Anadromous fish are blocked in many streams by deposits of logging debris or other material. Jam removal on 40 streams would open 132 miles of potentially productive spawning and rearing habitat. Estimated capital cost of this program would be $52,000, and an estimated production increase of 55,600 salmon annually would result as long as the jams do not reoccur.

Damaging floods and unstable streamflows should be eliminated on many streams by use of impoundments, diversion systems, or high water overflow channels. A total of about 660 miles of streams could be improved by these means and provide an estimated minimum production increase of more than 211,000 salmon annually.

Basic water productivity, amount of shade and cover, water temperature, and natural food production should be supplemented or enhanced. Such habitat improvement is needed on 318 miles of 137 streams, and could increase salmon production by 757,000 fish annually. This program would require a capital expenditure of $1,043,000 and is proposed for completion during the 1980-2000 period.

Many subregion streams could be improved by structures such as gabions and weirs to develop pools and riffles. The Type II report identifies 66 streams where changes in stream profile would enhance fish production.

Habitat improvement for marine fish should include construction of production "reefs," particularly adjacent to major human population centers. This would involve creating attraction and protection mounds of select junk metal, rock, or concrete.

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 82.

Greater Harvest

One of the most pressing needs in the subregion is acquisition and development of fisherman access to underutilized fresh and marine waters.

Many lakes, particularly those at low elevations, are closed to the public, and consequently support relatively little use. By 1980, access rights should be acquired and access areas developed on 87 of these lakes at an estimated cost of $1,675,000. A fishing pier should be constructed at one lake. Estimated capital cost is $65,000.

Private ownership limits angling pressure on many river reaches. Specific sections of riverbanks should be acquired for bank fisherman use, and boat launching ramps, parking areas, and sanitary facilities constructed. Public access rights to 510 miles of stream should be acquired prior to 1980, and the areas developed for the use of anglers, hunters, boatowners, and picnickers. Estimated program cost is $8,798,000.

Table 82 - Fish Habitat Improvement Means, Subregion 11

Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Stream improvement	mile	123	246.0	114	228.0	113	226.0
Lake improvement	acre	996	815.0	1,072	768.7	1,022	734.3
Sub-totals			1,061.0		996.7		960.3
Planning							
Fish stream surveys	mile	530	16.0	Not available		Not available	
Fish lake surveys	acre	5,270	42.0	Not available		Not available	
Sub-total			58.0				
Total			1,119.0				

Non-Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement							
Stream	mile	100	5,731	450	3,345	275	4,538
Lake	acre	22,900	2,420	10,900	1,152	16,579	1,751
Fish lakes	acre	270	1,515	170	535	600	3,360
Totals			9,666		5,032		9,649

Fence pass-thru structures facilitate angler access on private land. (Washington Department of Game)

Public access to salt water is very restricted. More boat launching areas and beaches and flats are needed to adequately serve the public, and to achieve better utilization of fish, shellfish, and waterfowl.

Developments in marine waters should include fishing piers and jetties designed specifically for use by sportsmen (table 83). In addition, fisherman access facilities should be incorporated into development of such structures by private and municipal interests.

A number of shellfish species, such as horse, geoduck, and softshell clams, mussels, and piddocks are not fully utilized. Greater use of these resources could result from slight changes in demand, or in harvesting and processing technology.

Table 83 - Estimated Developments Needed to Satisfy Projected Marine Fish Angler-Days, Subregion 11

Proposal	Unit	1980	2000	2020
Construct or make available fishing piers or jetties	mile	2.3	4.6	7.4
Construct fishing "reefs"	mile	1.2	2.3	3.7
Develop marine fishing access areas	each	60	120	190

Source: Puget Sound and Adjacent Waters Comprehensive Water and Related Land Resources Study Report, Appendix XI, Fish and Wildlife, March 1970.

Augmentation of Supply

There are many sites in the subregion suitable for development of artificial propagation facilities for salmon, including hatcheries, egg incubation or spawning channels, and controlled artificial rearing impoundments.

A total of 12 new salmon hatcheries will be required between 1980 and 2000 to produce an estimated 596,000 adult fish annually at a capital cost of $8,160,000. An estimated 31 additional hatcheries, or hatchery equivalent production facilities, will be needed during the 2000-2020 period to produce an additional 1,389,000 salmon at an estimated capital cost of $31,620,000.

There are numerous sites for development of eyed-egg salmon incubation channels or artificial spawning channels located throughout the subregion. More than 140 miles of such sites, which would principally benefit chum and pink salmon, have been noted. An estimated 2 miles of spawning channel to produce 240,000 pink and chum salmon annually will be needed by 1980, primarily to perfect operation techniques. Estimated capital cost is $1,400,000. An additional 10 channels with an estimated annual 1,200,000 pink and chum production will be needed between 1980 and 2000 at an estimated cost of $7 million. In the 2000-2020 period, 7 more channels will be needed for pink and chum, and 1 for sockeye. Total capital cost is estimated at $5,600,000 and production, 990,000 fish annually. This assumes that necessary techniques research is conducted in the near future.

Many sites are suitable for development of controlled natural rearing impoundments, primarily for chinook and coho salmon. More than 30 sites covering over 650 surface acres have been charted.

Between 1980 and 2000, impoundments totaling an estimated 70 surface acres would be needed at an estimated capital cost of $385,000. The average annual production would be 63,000 salmon. An additional 600 surface acres of ponded area would be needed between 2000 and 2020 at an estimated capital cost of $3,306,000. Estimated annual production would be 712,000 adults.

At the present productivity level, most of the future need for trout must be satisfied by artificial propagation. If the natural productivity can be increased through development of new management techniques, propagation costs would be less than those proposed. Essential projects are as follows:

(1) Construct new trout hatcheries, and expand existing hatcheries at an estimated total cost of $16,522,000.

(2) Construct spawning channels at an estimated total cost of $195,000.

(3) Construct rearing ponds for steelhead and searun cutthroat at an estimated total cost of $1,515,000.

(4) Develop salt water rearing areas for searun cutthroat trout at an estimated total cost of $150,000.

Put-and-take stocking programs would distinctly benefit sport shellfish harvest. These would be initiated in areas close to major metropolitan centers wherever possible, and would provide sport harvest for significant numbers of people. Intertidal clam ground has been formed with earth-moving equipment by several clam farmers, and may be used to increase production in certain areas. Such methods might also be applied to increase sport harvest.

Hunting

Subregion 11 will need to provide an additional 1,010,000 hunter-days by 2020. This goal can be reached only through an extensive program of habitat preservation to maintain present numbers of animals and provide a base for increasing production through habitat improvement. This program is also needed to assure the public a place to hunt.

Habitat Preservation

Preservation of existing habitat is essential. To satisfy demand, maximum potential of key wildlife areas must be realized and better use and enhancement of the resources of all areas required. Forest management should be developed to maximize big game and native upland game production and utilization in a manner

most compatible with other forest uses. Preservation of marsh and key estuarine areas vital to waterfowl, fur animals, and shorebirds is essential during future industrial and urban development of salt water bays. Farming practices which retain interspersed upland bird cover and natural streambank habitat should be adopted. Water developments which inundate key wildlife habitat must be avoided, and replacement must be provided if the development of one resource depletes another. Conservation and enhancement of the renewable wildlife resource must be a prime consideration in planning and management.

There are numerous opportunities to preserve wildlife habitat. Green belts and flood plain zoning have long been advocated by various groups to prevent wholesale destruction on highly productive lands. These actions would prevent the indiscriminate construction of highways, industries, and urban areas which are not water dependent and do not require productive soils. After being zoned, these lands could withstand occasional flooding and continue to produce agricultural crops and wildlife and provide open space and recreation.

Puget Sound is a primary migration and wintering area for waterfowl and other migratory birds of the Pacific Flyway. Therefore, it contributes to hunter and other recreational use that occurs elsewhere in the flyway. Preserving strategically located and dwindling habitat is imperative and is included in management planning. Nisqually Flats, Port Susan, Elk Marsh, Indian Island, and Padilla, Samish, and Union Bays are among the areas with significant resource and habitat preservation and development potential.

Habitat Improvement

Conflicting uses, poor soils, and natural deterioration resulting from plant succession typify much of the subregion's wildlife habitat. Future programs to satisfy hunting needs will require habitat improvement measures, such as revegetating wildlife areas with desirable cover and food species. During winter, big game is dependent upon low-lying land affording an abundance of ground vegetation for food and cover. This type of habitat is of poorest quality in old growth and dense second growth timber, and brush areas where low vegetation is sparse. Specific measures to improve and enlarge low elevation deer and elk range could include special programs to modify timber harvest so that annual cuttings include specified wildlife areas and thereby provide continuing habitat improvement. Some types of vegetation could be removed by controlled burning or other measures and benefit wildlife and the timber industry by promoting regrowth of desirable timber.

Publicly financed irrigation or flood control projects should compensate for wildlife losses and provide wildlife

enhancement. This could be accomplished by designating that certain project lands or features be retained in public ownership and improved specifically for wildlife purposes. Management of these lands would vary with species involved, but waterfowl and upland game areas would probably require an assured water supply for irrigation and ponds for maximum production.

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are shown in table 84.

Greater Harvest

Much of the game habitat, including private farmland and timberland, municipal water supply watersheds, and tidelands, is unavailable to hunters or not used to full capacity. Opening these lands to hunting would provide significant benefits from both wild and liberated game at reasonable cost. Many areas not under private hunting lease could probably be opened under cooperative agreement between owners and the Washington Department of Game. Such agreements would provide access for hunting, and other wildlife-associated recreation, in return for hunter control and insurance against vandalism. Similar cooperative programs requiring preservation of key habitat could be conducted on a subsidy or donation basis. Benefits from the above programs are estimated at 36,800 hunter-days annually, valued at $147,000 by 1980. Annual costs are estimated at $50,000.

Augmentation of Supply

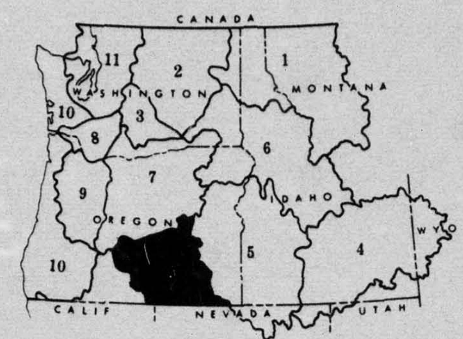
Needs for upland game can be satisfied by expanding existing game farms and developing new facilities. Expansion cost (capital) is estimated at $800,000. Annual benefit would be an estimated 42,000 hunter-days valued at $168,000, in addition to benefits included under other projects and programs.

Table 84 - Wildlife Habitat Improvement Means, Subregion 11

		Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Seeding and planting	acre	6,975	697.5	5,835	583.5	5,710	571.0
Forage release & prescribed burning	acre	2,970	74.3	5,750	143.7	2,880	72.0
Permanent openings	acre	1,810	181.0	8,270	827.0	6,620	662.0
Shallow impoundments and marsh improvements	acre	80	61.0	--	--	--	--
Develop nesting facilities	each	220	11.0	160	8.0	--	--
Lake acquisition and development	acre	4,000	2,000.0	--	--	--	--
Sub-totals			3,024.8		1,562.2		1,305.0
Planning							
Big game range analysis	acre	1,326.6[1/]	135.0	Not available		Not available	
Upland game habitat surveys	acre	900.0[1/]	45.0	Not available		Not available	
Habitat management plans	each	90.0	45.0	Not available		Not available	
Sub-total			225.0				
Total			3,247.8				

		Non-Federal					
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement[2/]	acre	86,000	22	101,000	32	124,000	48
Land acquisition[3/]	acre	71,000	20,247	34,000	9,637	51,000	14,617
Fencing[4/]	mile	89	31	42	14	64	22
Totals			20,300		9,683		14,687

1/ In thousands.
2/ Includes cover plots, food patches, fencing, marsh development, potholes, nest structures, etc., not identified specifically in the table.
3/ Obtained by fee purchase and easement rights.
4/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land.



LOCATION MAP

SUBREGION

12

AD-A036 559 PACIFIC NORTHWEST RIVER BASINS COMMISSION VANCOUVER WASH F/G 8/6
COLUMBIA-NORTH PACIFIC REGION COMPREHENSIVE FRAMEWORK STUDY OF --ETC(U)
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GENERAL DESCRIPTION OF SUBREGION

The Oregon Closed Basin includes 17,904 square miles in south central Oregon. It is bordered by Owyhee and Malheur River drainages on the east, John Day and Deschutes systems to the north, upper Klamath River tributaries and Goose Lake to the west, and on the south by the Nevada State line. Elevations range from 4,030 feet above sea level in Alvord Desert to 9,720 feet at the summit of Steens Mountain.

The subregion is characterized by mountains, rugged buttes and escarpments, lava flows, and broad sagebrush-covered plateaus. Creeks and intermittent streams carry runoff from these highlands to alkali lakes that dot the lowlands. Several of the larger lakes hold water most of the time, while the smaller, more numerous wet-weather lakes are often barren alkali flats. Although coniferous forests occur on portions of the subregion's northern and western

High desert country, the subregion supports a variety of fish and wildlife. (Bureau of Land Management)

fringe, the sagebrush, sagebrush-juniper, and sagebrush-bunchgrass associations typical of the high desert cover most of the area. Portions of the valleys and lake basins are irrigated, producing hay, pasture, and small grains.

This subregion has a semiarid climate. Rainfall averages about 10 inches annually, but is less than 8 in some areas. Over much of the subregion the growing season averages only about 80 days. Temperatures vary widely and may be very cold in winter and very hot in summer.

HISTORY OF FISH AND WILDLIFE

Although fossil salmon bones have been found in this subregion, there is no outlet to the sea, and there have been no runs of anadromous fish in historical times. Cutthroat trout is the only native game fish.

Historically, the grass-covered plateaus and valley meadows supported bison, but they disappeared shortly before the white man arrived. Mule deer were scarce in 1826 when Peter Skene Ogden led a large party of Hudson Bay trappers through Malheur Lake Basin. Other large ruminants included elk, pronghorn antelope, and mountain sheep. Large predators native to the area were grizzly bear, black bear, mountain lion, and wolf. Other predators included coyote, lynx, bobcat, and badger. Native upland game birds were sharp-tailed grouse, sage grouse, mourning dove, valley and mountain quails, and blue and ruffed grouses. Abundant jack rabbit provided both food and clothing for the Paiute Indians.

Like the early trappers, immigrants on their way to the Willamette Valley and freighters serving the Idaho gold fields found this a harsh, inhospitable land. However, stockmen brought cattle, sheep, and horses to the closed basin during the late 1860's and early 1870's. Large cattle and sheep ranches were established, the first by John Devine in 1868. Itinerant sheepherders grazed their flocks on the grassy mountains and plains. Large herds of horses, descendents of domestic stock gone wild, roamed the same rangelands.

Juniper, sagebrush, greasewood, horsebrush, and other semidesert shrubs invaded the overgrazed area. Cheat grass and other annuals replaced the natural bunchgrasses except in areas inaccessible to livestock. About 1885 the last mountain sheep died, probably from scabies contracted from domestic sheep. The elk, which occupied limited ranges in Silvies River and Silver Creek watersheds, were also probably killed off about then. As range conditions worsened and human population increased, mule deer and antelope numbers declined. Sharp-tailed grouse probably also declined during this

period. Sage grouse may have increased. During the 1900's, mostly before 1920, vast areas were homesteaded. Most of these homesteads were abandoned after a few years, but subsistence hunting by the settlers and destruction of the rangeland by the plow further decreased numbers of mule deer, pronghorn, and sharp-tailed grouse. By 1920 deer were found only in the forested areas, and pronghorn were reduced to a few small herds ranging the area between Steens and Hart Mountains. Grizzly bear, black bear, mountain lion, and wolf by this time had also been exterminated, or nearly so, as livestock predators. Sharp-tailed grouse had become scarce, but sage grouse were found in large numbers and were the only resident game animals in vast areas of the subregion.

From earliest times, waterfowl were numerous in the large, shallow lakes and marshes of Malheur, Silver, and Summer Lake basins and Warner Valley lakes. Overshooting, coupled with drainage of wetlands and other decimating factors, affected birds of this subregion and the remainder of the continental population.

Between the early 1920's and the present, the wild horse herds have been destroyed, and sheep have given place to cattle. Large areas of rangeland have been rehabilitated. All game species have come under management.

Mountain sheep have been reintroduced. Mule deer have increased and now occupy most of their original range. Sharp-tailed grouse are probably extinct. Sage grouse populations are very low. Pronghorn have increased markedly. Ring-necked pheasant, Hungarian and chukar partridges, and several species of trout and warmwater fish have been introduced successfully. Quail have increased. Waterfowl numbers have decreased. Trumpeter swan have been reintroduced and a breeding population established at Malheur National Wildlife Refuge.

Human population of the area is very low. Only a few small water developments have been constructed, and these, in this water-deficient area, were of benefit to fish and wildlife.

PRESENT STATUS

All fish and wildlife groups, except anadromous fish, are represented here. Big game and waterfowl resources are especially important as indicated by the huge tracts of land dedicated to their use (figure 37). These lands and the extensive holdings of the Bureau of Land Management offer substantial potential for development of wildlife resources.

FIGURE 37. EXPLANATION

Symbol No.	Name	Area - 1965 (Acres)
1	Yellowjacket Reservoir	34
2	Summer Lake Game Management Area	17,000
3	Malheur National Wildlife Refuge	181,000
4	Hart Mountain National Antelope Refuge	240,000
5	Fish Lake Fish Management Area	640
6	Sheldon National Antelope Refuge	628

Estimated sportsman expenditures attributable to fish and wildlife resources were about $1,250,000 for hunting and $600,000 for fishing in 1965.

Resident Fish

Rainbow are the most numerous trout and sustain the greatest fishing pressure. Other salmonids are kokanee, brook trout, and cutthroat trout, including the endangered Lahontan cutthroat trout and the Catlow Valley trout. Bluegill and pumpkinseed sunfish, brown bullhead, white crappie, and yellow perch are the most plentiful warmwater game fish. Other game fish include largemouth bass. Nongame fish include sucker, carp, roach, chiselmouth, shiner, squawfish, and sculpin. In addition to the two endangered species already mentioned, there are at least eight endangered species of nongame fish.

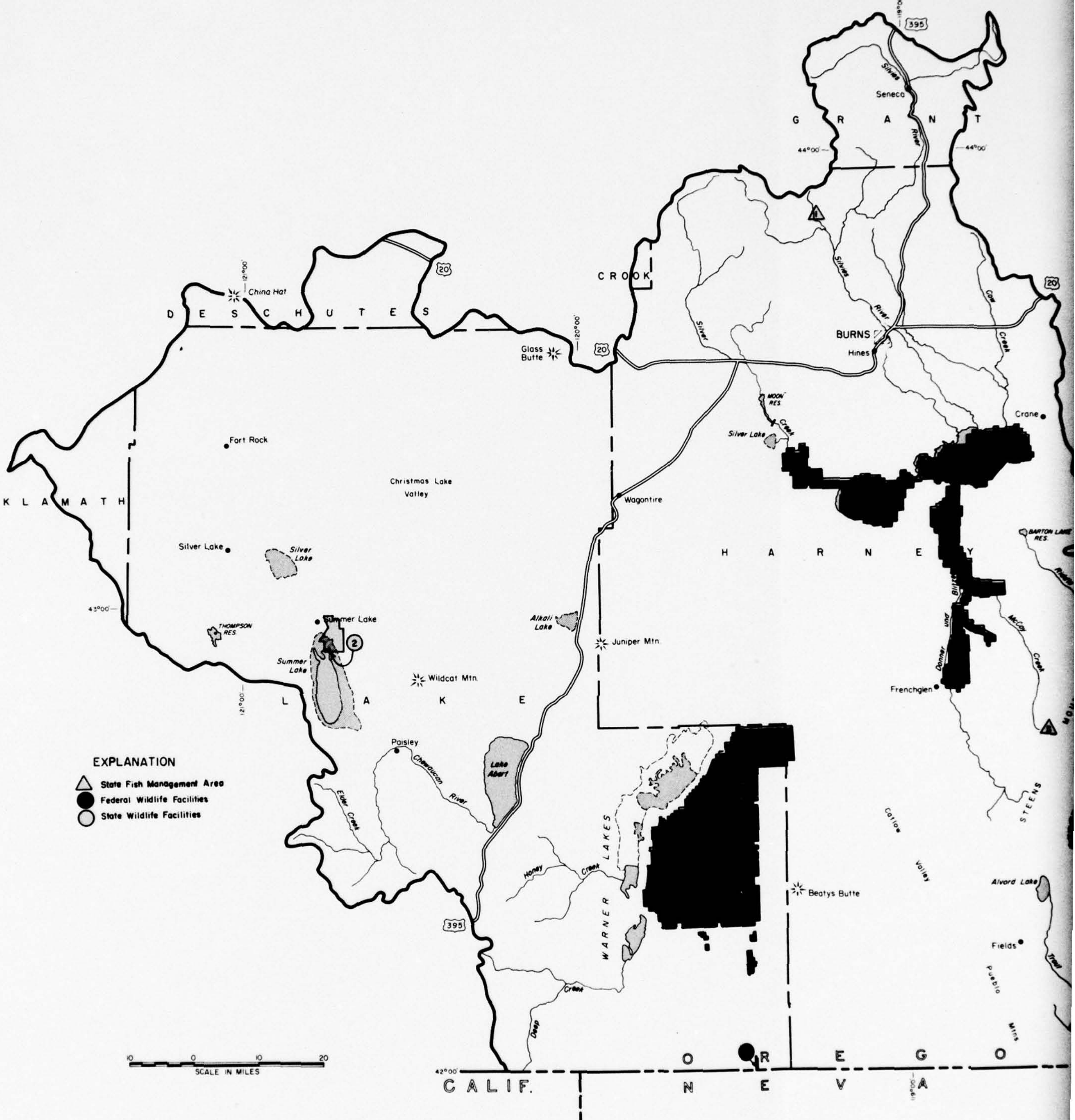
Habitat

Streams originate in mountainous areas, flow relatively short distances, and terminate in large, usually alkaline lakes. Heavy spring runoff and low summer flows characterize these streams. Many are reduced to small trickles or dry up completely during low-water years. All streams, particularly their lower reaches, are heavily appropriated for irrigation. Mountain lakes, manmade reservoirs, and headwaters of streams support the principal fisheries. Though the quantity of fish-producing waters is small compared to other subregions, these waters are highly productive. Figure 38 illustrates present distribution of fish in the subregion.

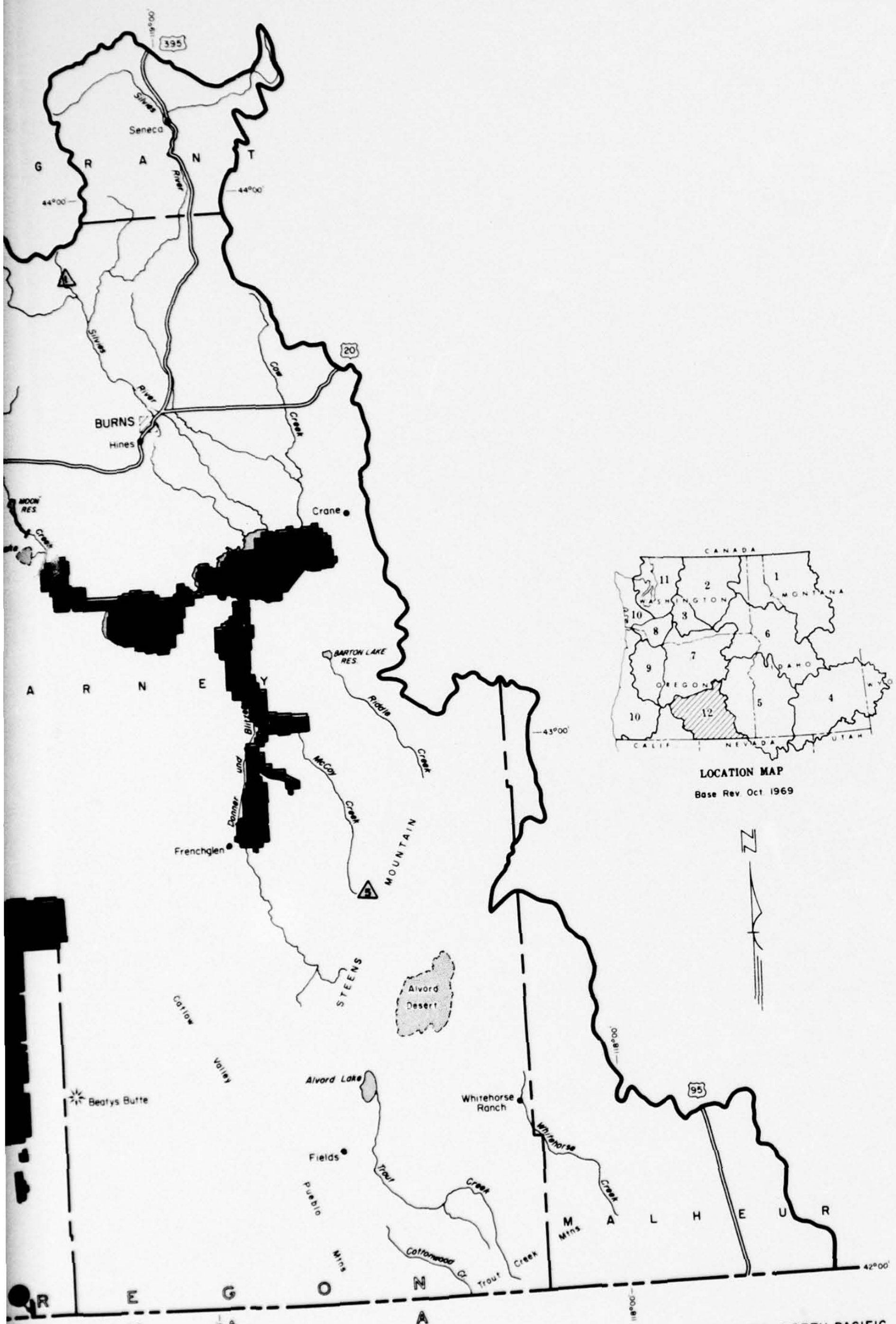
Use

Fish supplied an estimated 129,000 angler-days in 1965. Table 85 shows an analysis of this use.

1


395
Seneca
Silvies River
G R A N T
44°00'
CROOK
20
China Hat
121°00'
D E S C H U T E S
Glass Butte
120°00'
BURNS
Hines
Silver Creek
Cow Creek
Crane
MOON RES.
Silver Lake
Fort Rock
Christmas Lake Valley
K L A M A T H
Wagontire
H A R N E Y
Silver Lake
Silver Lake
BARTON LAKE RES.
43°00'
THOMPSON RES.
Summer Lake
Summer Lake
Alkali Lake
Juniper Mtn.
Wildcat Mtn.
L A K E
Frenchglen
Donner und Blitzen
McCoy Creek
EXPLANATION
State Fish Management Area
Federal Wildlife Facilities
State Wildlife Facilities
Paisley
Chewaucan River
Lake Abert
Elder Creek
WARNER LAKES
Honey Creek
Catlow Valley
STEENS
Beatys Butte
Alvord Lake
Fields
Pueblo Mtns
Deep Creek
10 0 10 20
SCALE IN MILES
42°00'
O R E G O
CALIF.
N E V A

2



COLUMBIA~NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

LANDS AND FACILITIES
DEVOTED TO FISH AND WILDLIFE

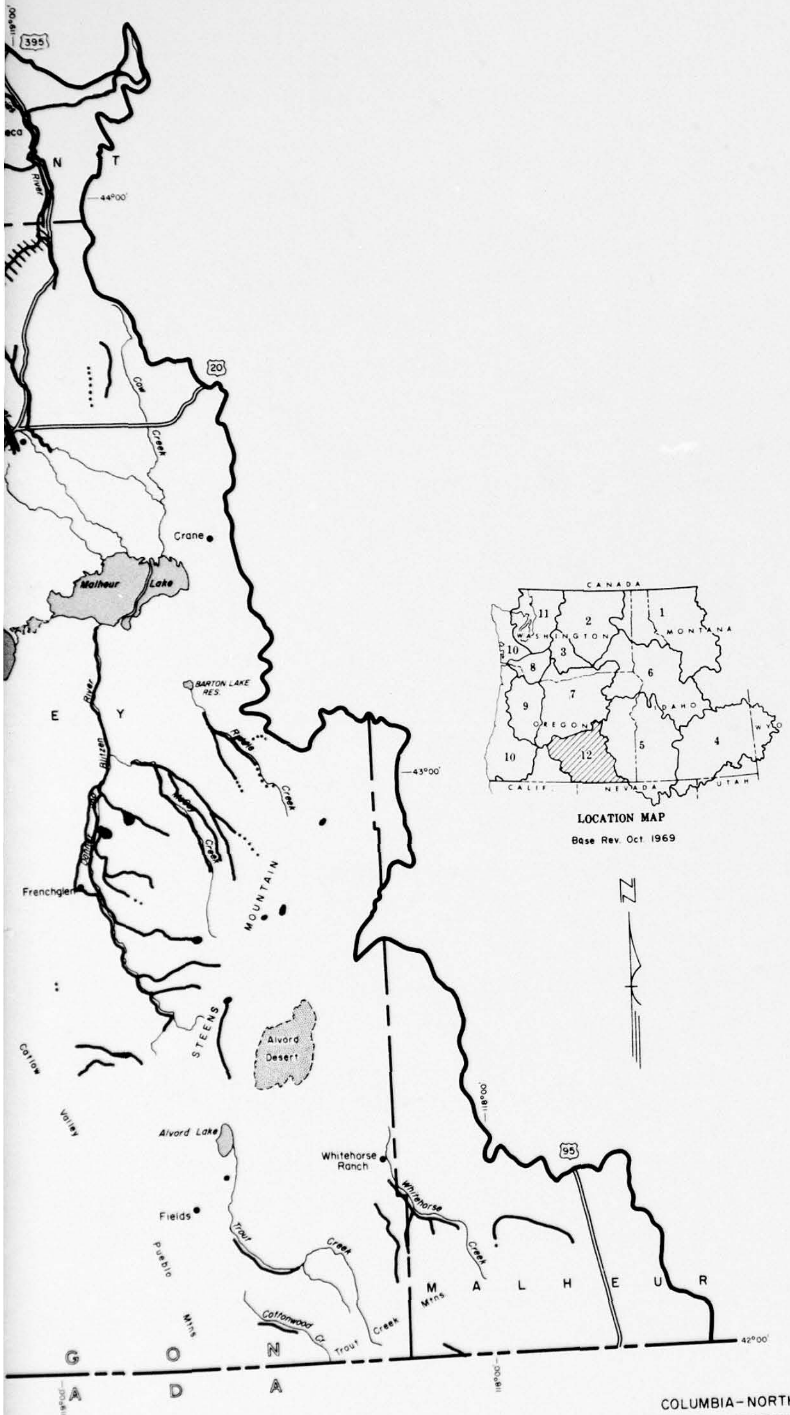
OREGON CLOSED BASIN
SUBREGION 12

1970

FIGURE 37

EXPLANATION
Trout (known)
Trout (suspected)
Warm water game fish (known)
Warm water game fish (suspected)
SCALE IN MILES
10 0 10 20
DESCHUTES
CROOK
GRANT
KLAMATH
LAKE
HARNEY
CALIF.
OREGON
NEVADA
China Hat
Glass Butte
Fort Rock
Christmas Lake Valley
Silver Lake
Summer Lake
THOMPSON RES
Wildcat Mtn
Alkali Lake
Juniper Mtn.
Wagontire
Paisley
Lake Abert
Chewaucan River
Elder Creek
Honey Creek
WARNER LAKES
Deep Creek
Beatys Butte
Seneca
BURNS
Hines
MOON RES
Silver Creek
Malheur Lake
Harney Lake
Crane
Cow Creek
Silvies River
BARTON LAKE RES.
Blitzen River
Frenchglen
Catlow Valley
STEENS MOUNTAIN
Alvord Lake
Fields
Pueblo Mtns
Trout Creek
395
20
44°00'
43°00'
42°00'
121°00'
120°00'
119°00'

2



COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

GAME FISH DISTRIBUTION

OREGON CLOSED BASIN
SUBREGION 12

1970

FIGURE 38

Table 85 - Estimated Sport Fishing Use of Resident Fish, Subregion 12, 1965 1/

Waters	Angler-Days
Streams	60,630
Lakes and Ponds	9,030
Reservoirs	59,340
Total	129,000

1/ Estimates based on Oregon State Game Commission data.

Angling for resident fish accounted for an estimated expenditure of $600,000.

The demand for trout fishing equals or exceeds supply, and requires extensive stocking. During 1965 about 27,000 pounds of trout and kokanee were stocked. The warmwater fishery is growing, but could support much more use.

Factors Affecting Resource

Low summer flows, high water temperatures, and alkalinity are the principal factors limiting trout survival and production in

Many productive trout streams experience low summer flows. (Oregon State Game Commission)

many streams, lakes, and reservoirs. Excessive water level fluctuations and nongame fish populations also limit game fish productivity.

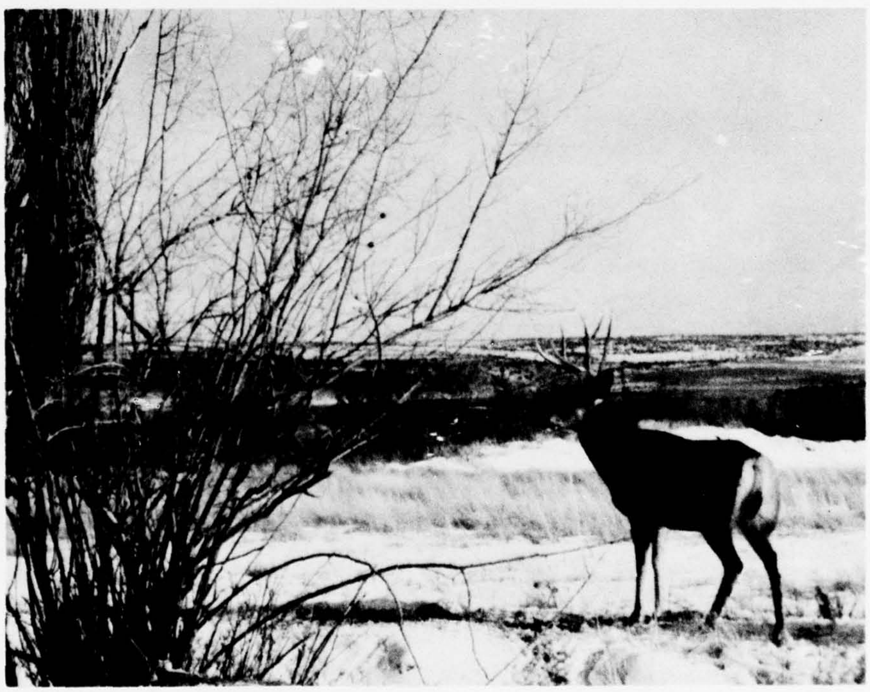
Beneficial factors include nongame fish eradication programs, followed by restocking with game fish; construction of new impoundments to provide reservoir fisheries and improve streamflows; and introduction of new species suited to certain types of habitat. About 20 farm ponds in this subregion are managed for fish production.

Big Game

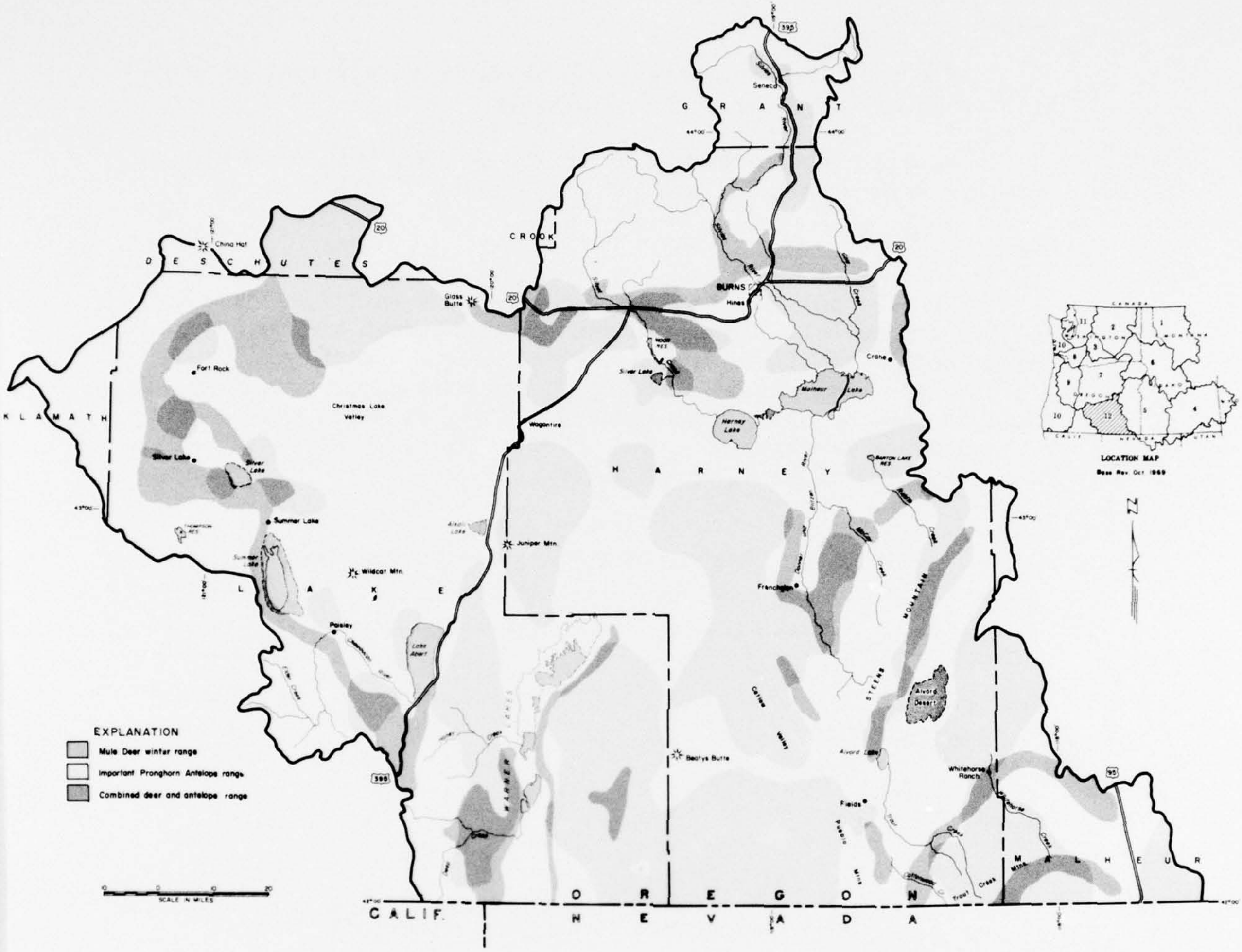
Mule deer and pronghorn antelope are the principal big game species. Elk, black bear, and mountain sheep occur in limited numbers.

Habitat

Mule deer are found throughout the area, but generally winter on the sagebrush plains and plateaus, and summer at higher elevations. Figure 39 shows the distribution of winter range for this species.



Subregion habitat supports substantial populations of mule deer. (Oregon State Game Commission)



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

ANTELOPE AND MULE DEER RANGES

OREGON CLOSED BASIN
SUBREGION 12

1970

FIGURE 39

During the summer, pronghorn disperse over the rangelands, but congregate in specific areas during winter and use specific kidding grounds in spring. Figure 39 shows critical antelope range.

Elk and black bear are found in forested sections of upper Silvies River and Silver Creek drainages.

Mountain sheep were reintroduced on Hart Mountain National Antelope Refuge in 1954, and later on Steens Mountain.

Use

Hunters pursuing big game spent more than 111,000 man-days in 1965 (table 86). Pronghorn and mountain sheep are hunted by permit only. The first open season on mountain sheep in Oregon for over 40 years was held in 1965. The demand for pronghorn and mountain sheep hunting far exceeded supply, as shown by the ratio of applicants to permits issued. For pronghorn this ratio was 6.4:1, and for mountain sheep 319:1.

Table 86 - Estimated Hunting Use of Big Game, Subregion 12, 1965 1/

Species	Hunter-Days
Mule Deer	105,820
Pronghorn Antelope	920
Elk	2,820
Mountain Sheep	12
Black Bear	1,000
Total	110,572

1/ Estimates based on Oregon State Game Commission data.

Hunters spent about $1,000,000 in pursuit of big game resources in 1965. Although Subregion 12 contains less than 20 percent of Oregon's area and less than 1 percent of its human population, it provided 15 percent of the deer hunting, and 66 percent of the pronghorn hunting.

Deer hunting is a rewarding recreational experience. (Bureau of Land Management)

Factors Affecting Resource

Deer population and distribution are limited by availability of winter range and water. Pronghorn numbers are restricted by range conditions, high kid mortality, and water availability. Disease and competition from deer and domestic livestock are the major factors limiting mountain sheep. A scarcity of forest habitat limits elk and black bear populations.

Big game winter ranges often are depleted by year-long livestock use. Severe damage to forage plants is common near waterholes and other concentration areas. State and Federal agencies, and private ranchers, are cooperating to relieve this problem by planting and seeding overgrazed range. Numerous small water-storage facilities such as spring and waterhole developments, small impoundments, and cisterns have been constructed for livestock in recent years. These sometimes directly benefit deer and pronghorn by redistributing grazing pressure. Despite these efforts, water remains a principal factor limiting the ability of big game to meet their full population and distribution potential in most of the subregion.

Hart Mountain National Antelope Refuge provides vital protection to pronghorn kidding grounds and mountain sheep populations (figure 39).

Upland Game

Principal upland game birds include ring-necked pheasant, sage grouse, chukar, valley quail, mountain quail, and mourning dove. Hungarian partridge, ruffed grouse, blue grouse, cottontail, jack rabbit, and pigmy rabbit complete the list of upland game.

Habitat

Ring-necked pheasant inhabit irrigated agricultural areas of Malheur Lake basin where small grain crops, alfalfa, grassy ditchbanks, and fence rows are abundant. They are also found on irrigated lands in small isolated areas near Abert Lake, Summer Lake, and Warner Valley. Sagebrush areas immediately adjacent to irrigated lands also support pheasant (figure 40).

Sage grouse are dependent on sagebrush most of the year. However, during the brood season they invade alfalfa fields or move to higher elevations seeking lush vegetation.

Chukar inhabit the rock-sagebrush-grass terrain so characteristic of this subregion. They are usually found relatively close to a water source (figure 40).

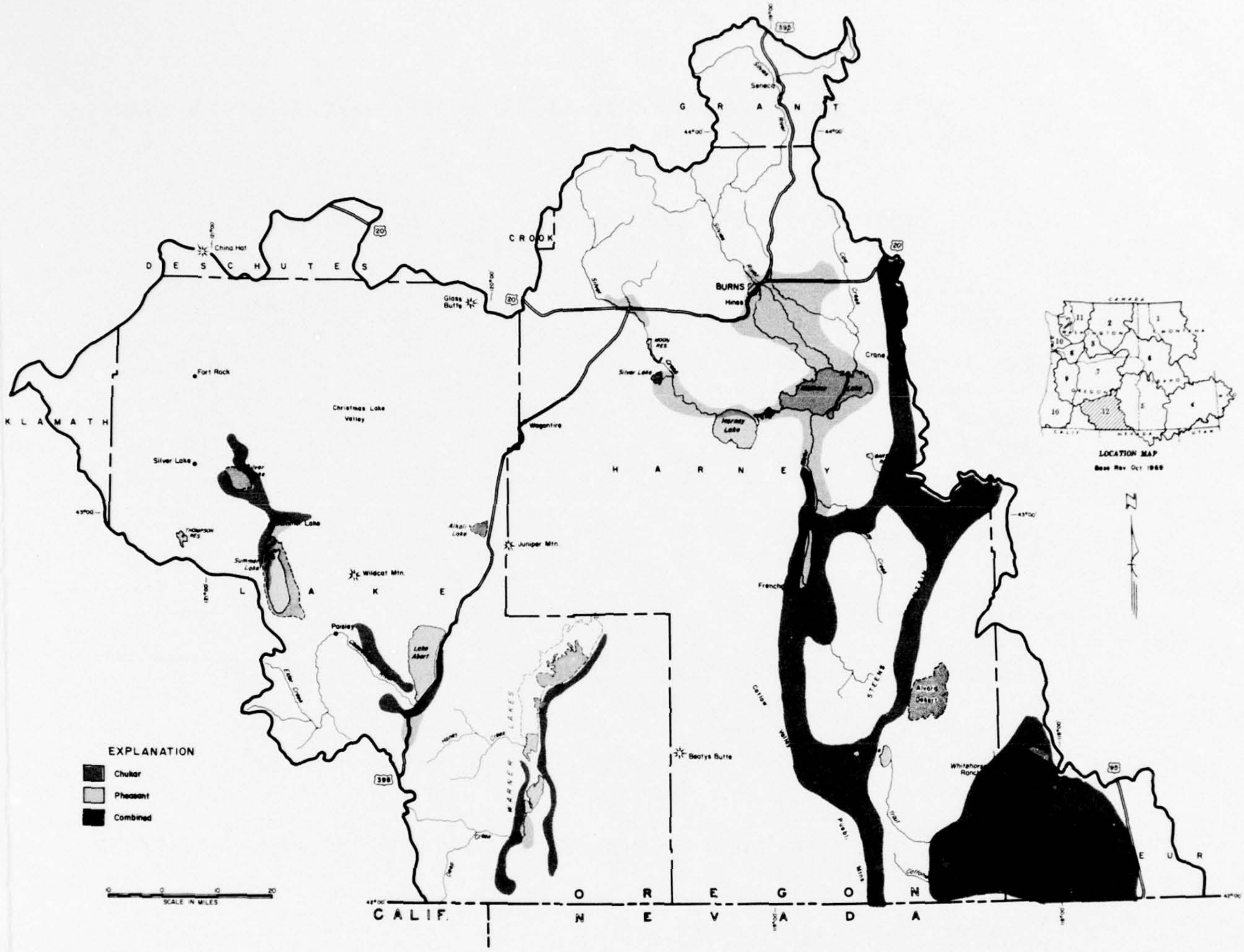
Valley quail are closely associated with brushy watercourses and irrigated small grain crops. Mountain quail inhabit brushy creeks and draws lining the mountain faces.

Mourning dove nest in habitat as varied as that of the subregion itself. Although most abundant on irrigated lands, they also occur on sagebrush rangelands and forested mountain slopes.

Hungarian partridge are thinly distributed on agricultural lands, as well as on grassy slopes and draws frequented by chukar.

Ruffed grouse inhabit deciduous-conifer complexes found in the extreme northern portion of the subregion. Willow-lined creeks and aspen groves near coniferous trees are choice ruffed grouse habitat.

Blue grouse are also limited to the northern end of the subregion. They spend fall and winter at higher elevations in coniferous thickets. In spring and summer they descend into mountain valleys to nest and rear their broods.



COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

CHUKAR AND PHEASANT GENERAL RANGES

OREGON CLOSED BASIN
SUBREGION 12

1970

FIGURE 40

Cottontail and pigmy rabbit are found in generally the same habitat as mourning dove. Jack rabbit occur throughout the subregion other than in densely forested areas.

Use

Upland game provided over 19,000 hunter-days of recreation in 1965 (table 87).

Table 87 - Estimated Hunting Use of Upland Game, Subregion 12, 1965 1/

Species	Hunter-Days
Ring-necked Pheasant	4,100
Sage Grouse	2,300
Chukar	1,600
Quails 2/	3,000
Mourning Dove	1,500
Hungarian Partridge	75
Forest Grouse 3/	25
Rabbits 4/	6,700
Total	19,300

1/ Estimates based on Oregon State Game Commission data.
2/ Valley and mountain quails.
3/ Ruffed and blue grouse.
4/ Cottontail, pigmy rabbit, and two species of jack rabbit.

Upland game hunters spent about $100,000 in pursuit of their sport during 1965.

Factors Affecting Resource

Since availability of water is the prime factor limiting upland game populations, recently constructed waterholes have been beneficial to this wildlife group as well as to big game.

Irrigation farming, with its associated canal systems, benefits pheasant, cottontail, and Hungarian partridge. Sagebrush spraying on large blocks of land adversely affects sage grouse and pigmy rabbit. Research indicates that strip spraying is less damaging and sometimes beneficial to these species.

Most species are adversely affected by overgrazing. Better range management has helped alleviate the detrimental effects of this factor.

Fur Animals

Principal fur animals are beaver, bobcat, and coyote. The muskrat is also important during years of high populations. Other species taken here include mink, raccoon, badger, spotted skunk, and weasel.

Habitat

Water-oriented fur bearers, beaver, mink, muskrat, and raccoon, are found along creeks, rivers, irrigation canals, reservoirs, lakes, and marshes. Coyote, bobcat, badger, spotted skunk, and weasel occur on the sagebrush desert and occasionally in forested mountains and foothills.

Use

The 15 licensed trappers reporting on the 1965-66 season harvested a total of 657 pelts. Additional harvest by nonreporting trappers and children under 14 years of age certainly occurred. Summer Lake usually produces an average of about 700 muskrat pelts, when the season is open. In addition, varmint hunting of coyote, bobcat, and raccoon takes substantial numbers.

The 1965-66 trapping season yielded a known harvest of over $6,700 worth of fur. Beaver, bobcat, and coyote pelts accounted for 96 percent of this total. The absence of a muskrat season markedly reduced the 1965 fur harvest value. Varmint hunters harvested over $26,200 worth of fur. Many of these pelts are not sold but kept as trophies.

Factors Affecting Resource

Most of the best marshes in the closed basin are under management by either State or Federal wildlife agencies (figure 37). Irrigation systems provide additional habitat for water-oriented fur animals.

Waterfowl

The Canada goose and mallard, gadwall, redhead, canvasback, ruddy, and cinnamon teal ducks nest in or near the marshlands. In addition, most species common to the western United States stop here on their migrations to and from the northern breeding grounds, and substantial numbers of birds winter. After many years absence from the subregion, the rare trumpeter swan has been reintroduced into Malheur National Wildlife Refuge.

Habitat

Paradoxically, although most of this subregion is semi-desert, it contains waterfowl areas that are nationally famous. This is because the few permanent and intermittent lakes and marshes are large, shallow, and very fertile (figure 41). The 184,000-acre Malheur National Wildlife Refuge is located in the heart of the largest of these wetland complexes. Oregon's Summer Lake Wildlife Management Area and the Warner Lakes basin are also very important waterfowl areas.

The waterfowl habitat consists of rivers and lakes, natural and managed marshes, canals and ditches of irrigation systems, and the associated uplands where many species find nesting cover and feeding grounds.

Use

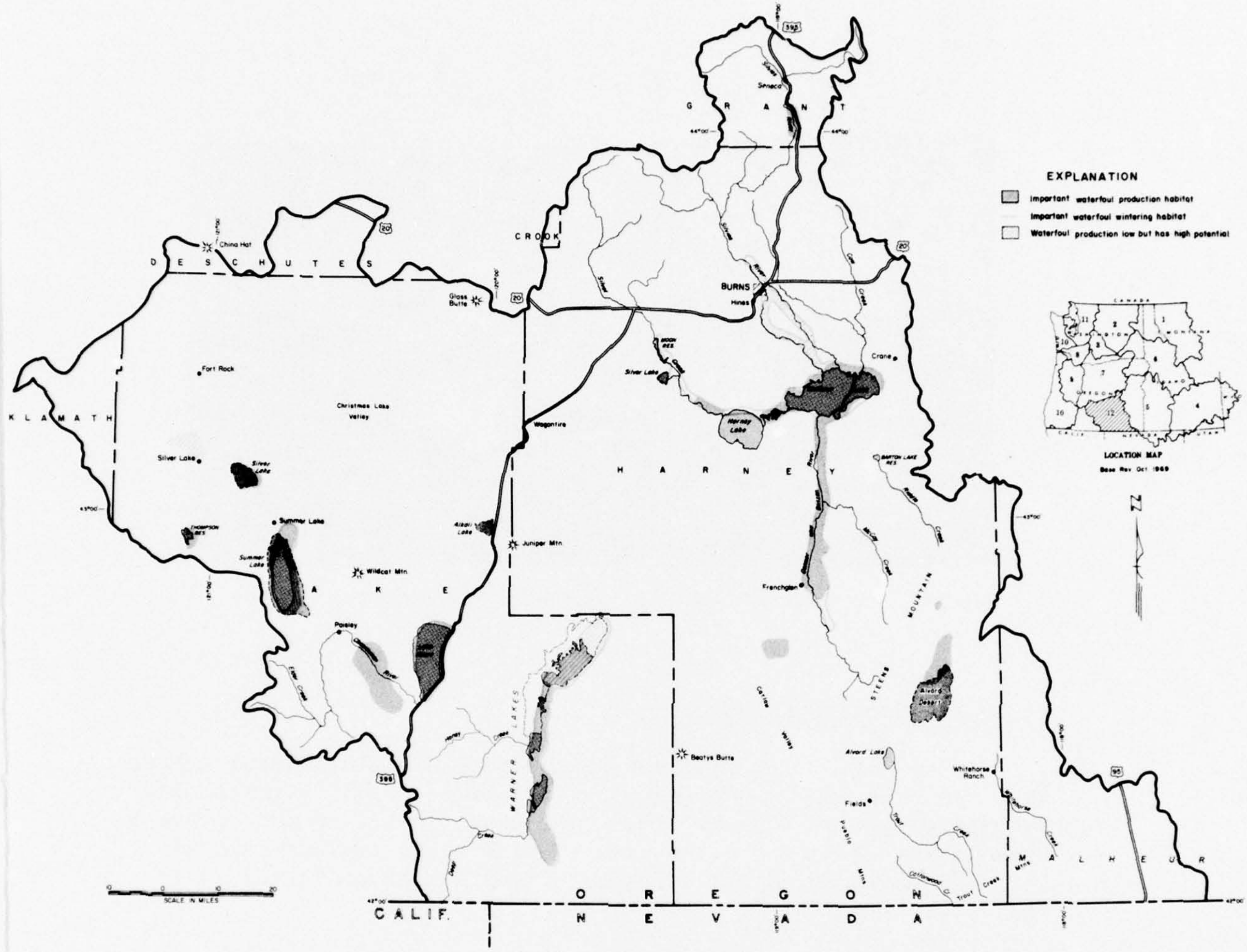
Waterfowl hunting amounted to more than 23,000 man-days in 1965 (table 88).

Table 88 - Estimated Hunting Use of Waterfowl, Subregion 12, 1965 1/

Waterfowl Group	Hunter-Days
Ducks	10,843
Geese	12,595
Total	23,438

1/ Estimates based on Oregon State Game Commission data.

Sportsman's expenditures for waterfowl hunting in 1965 amounted to about $150,000. The esthetic benefits provided the thousands of visitors who come to view the tremendous waterfowl concentrations each spring and fall are perhaps of even greater value. Additionally, waterfowl that use the subregion's wetlands provide hunting in other parts of the Pacific Flyway.



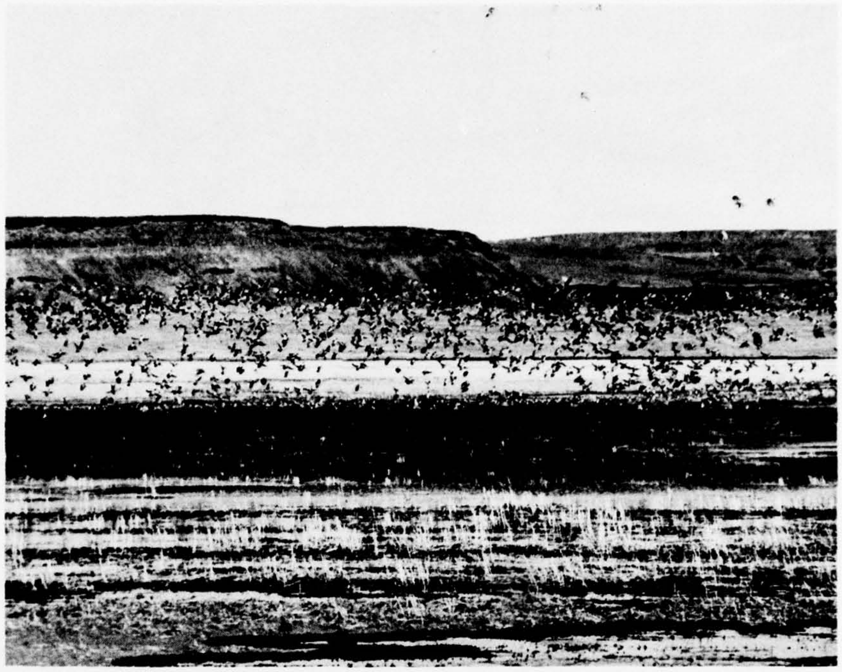
COLUMBIA–NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

IMPORTANT WATERFOWL HABITAT

OREGON CLOSED BASIN
SUBREGION 12

1970

FIGURE 41



Huge flocks of waterfowl thrill hunter and recreationist. (Oregon State Game Commission)

Factors Affecting Resource

Loss of wetland habitat is the most damaging factor affecting this resource. Such losses result from drought, storage, and overappropriation of water for other uses. Botulism can become a devastating factor in areas such as this where wetlands are in the form of large, shallow lakes. Predation accounts for large losses each year.

Beneficial factors include State and Federal waterfowl management programs, and the development of water distribution for irrigation.

Other Wildlife

The four wildlife groups previously mentioned do not constitute the entire wildlife resource of the subregion, but only the part classified as game. Many other wildlife species, some protected, some not, also inhabit the area.

The drawing power of these other species can be seen in the visitor lists at Hart Mountain National Antelope Refuge and Malheur

National Wildlife Refuge. Here, as well as elsewhere, thousands of people come to view songbirds, shorebirds, and other water-oriented birds, such as the sandhill crane, snowy egret, and bald eagle.

The unprotected members of this group offer substantial recreation to "varmint" hunters. This has been estimated to be in excess of 5,000 man-days annually.

APPRAISAL OF FUTURE NEEDS

Projections of demands and needs for all subregions are presented under the above heading in the "Regional Summary."

MEANS TO SATISFY NEEDS

The Oregon Closed Basin constitutes 6.5 percent of the region, but contains less than 1 percent of its human population. Agricultural, urban, and industrial development is expected to have a significant impact on fish and wildlife resources in some portions of this subregion. However, most fishing and hunting needs of the subregion's human population can be met within the subregion. Additionally, a portion of the needs of neighboring areas, particularly Subregion 9, could also be met here.

Fishing

Subregion 12 will need to support an additional 181,000 angler-days for resident fish by year 2020. Because of the limited amount of high-quality habitat available, this goal can be reached only by an intensive management program. Costs for providing increased angling needs are estimated to be $400,000 by 1980, $800,000 by 2000, and $800,000 through 2020 for a total of $2,000,000.

Preparation of a single-purpose plan to satisfy future fishing needs would require further studies. However, the following paragraphs outline some of the potential and presently planned programs to satisfy fishing needs.

Habitat Preservation

Present flows and water quality of trout streams must not be allowed to deteriorate. The physical character of the streams (bottom materials, meandering course, and bank vegetation) and their watersheds must also be retained. The following streams

should be preserved because of their present values and/or potential for high productivity through habitat improvement:

Donner und Blitzen River system - from origin to Frenchglen
Silvies River system - from origin to vicinity of Burns
Chewaucan River system - from origin to vicinity of Paisley
Silver Creek (Harney County) - from origin to vicinity of Morris Creek
Poison Creek - all
Riddle Creek - all
Deep Creek - all
Twelve-Mile Creek - all
Honey Creek - all
Trout Creek - all

Habitat Improvement

Improvement of fish habitat should be oriented toward increasing natural production. However, this program is also needed to provide more areas where hatchery-produced fish can be successfully released to provide more fishing. Limiting factors of subregion streams, lakes, and reservoirs include insufficient water, high water temperatures, high alkalinity, excessive water level fluctuation, and undesirable fish populations.

Small impoundments (especially in headwaters) could provide high-quality fish habitat, as well as augment summer streamflows and reduce water temperature in downstream reaches. Examples of suitable sites for "fishing lakes" are found in table 89.

Table 89 - Potential Fishing Lakes, Subregion 12

Site	Surface Acres	Capital Cost 1/	Target Year (Prior to)
Swamp Creek	55	$50,000	1980
Duncan Creek	50	$70,000	1980
Honey Creek	50	$40,000	1980
Deep Creek	60	$50,000	1980
Elder Creek	50	$50,000	2000
Buck Creek	25	$30,000	2020
Silvies River system 2/	-	-	-
Chewaucan River system 3/	-	-	-
Donner und Blitzen River system 2/	-	-	-

1/ Estimates not based on engineering studies.
2/ Impoundment of water on Silvies and Donner und Blitzen Rivers could have detrimental impact on Malheur National Wildlife Refuge.
3/ A privately financed irrigation impoundment is planned on Chewaucan River near Coffeepot Creek. Maximum surface acres, 2,400; minimum, 600 surface acres.

Habitat improvement should include structural measures such as gabions or sills to stabilize streambeds, create pools and riffles, and maintain channels. Most trout streams of the subregion could be improved by the above measures, but the following have the most potential based upon existing water quantity and quality:

Bear Creek	North Fork Silver Creek
Deadhorse Creek	Guyer Creek
Augur Creek	Burnt Creek
Dairy Creek (upper)	Dismal Creek
Buck Creek	Willow Creek
Bridge Creek	Elder Creek
West Fork Silver Creek	

Abert Lake is highly alkaline and too shallow to support a sport fishery. It is possible, however, that inflow could be impounded upstream from the lake on the Chewaucan River to create a productive sport fishery. Detailed studies are needed to determine what potentials might be realized under intensive development.

Projected fish habitat improvement means proposed by Federal and non-Federal agencies are shown in table 90.

Greater Harvest

Some natural populations of salmonid fish could provide modest increases in angling if access were improved. However, this potential would do little to satisfy future needs. Warmwater fish will support greater harvests at present population levels, but improved angler access may be required to satisfy future needs.

Augmentation of Supply

Hatchery fish offer the greatest potential for satisfying future angling needs, as natural production of salmonids does not support present angling. Measures to preserve and improve habitat as discussed earlier will be needed to provide not only a "living environment" for the hatchery fish, but also places for people to fish.

Several streams and springs offer hatchery development opportunities, but costs might be much lower if fish were produced outside the subregion and trucked in. Further studies are needed to determine the type of hatchery program that would most efficiently satisfy future production requirements.

Hunting

Subregion 12 will need to provide for an additional 196,000 hunter-days by the year 2020. Detailed studies are needed to

Table 90 - Fish Habitat Improvement Means, Subregion 12

Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Stream improvement	mile	20	40.0	30	60.0	30	60.0
Spawning bed improvement	mile	200	400.0	200	320.0	200	320.0
Rough fish removal (streams)	mile	550	.7	690	.9	640	.8
Rough fish removal (lakes)	acre	600	.3	600	.3	700	.4
Stream channel preparation	mile	25	200.0	25	200.0	50	400.0
Lake improvement	acre	720	540.0	960	720.0	950	713.0
Sub-totals			1,181.0		1,301.2		1,494.2
Planning							
Fish stream surveys	mile	30	1.0	Not available		Not available	
Fish lake surveys	acre	50	1.0	Not available		Not available	
Sub-total			2.0				
Total			1,183.0				

Non-Federal

Measure	Unit	1980 Amount	1980 Capital Cost ($1000)	2000 Amount	2000 Capital Cost ($1000)	2020 Amount	2020 Capital Cost ($1000)
Habitat improvement							
Stream	mile	103	63	201	112	210	38
Lake	acre	1,000	80	2,000	160	2,000	160
Fish lakes	acre	205	210	50	50	25	30
Totals			353		322		228

determine specific measures and costs necessary to provide hunting needs.

Esthetic or nonhunting use of wildlife is expected to increase many times by the year 2020. No specific programs are proposed for this purpose, as measures to satisfy hunting needs will also enhance the game and nongame animals needed to satisfy nonhunting needs. However, it is important that development plans be analyzed for opportunities to develop, preserve, or enhance wildlife species and areas having esthetic values. This is especially true of rare and endangered species. Sites near recreation areas and travel routes should be given special attention.

Supplying future hunting and nonhunting needs requires solution of numerous problems. For example, blockage of access to some public lands by private landholdings limits the options open to the wildlife manager and use opportunities. Also, the trend toward clearing sagebrush desert land and revegetating with non-native grasses poses a grave threat to significant segments of the high, desert ecosystem. Overuse of some wildlife habitat by wild animals and livestock is a serious factor. Solution of these problems would benefit all wildlife groups.

Habitat Preservation

Key big game habitat (e.g., deer winter range and antelope kidding grounds) as identified in "Present Status" must be preserved for the primary use of game populations. Most of this habitat is managed by Federal agencies, but some private land needs to be managed to safeguard key areas.

Reduction in cropland acreage, forecast by 2020, will mean fewer pheasant, Hungarian partridge, mourning dove, valley quail, and cottontail on private lands. As a result, key upland game habitat will be concentrated on Federal or State lands, and use permits should be granted on these lands only when there will be no adverse impact on wildlife.

The Malheur National Wildlife Refuge and Summer Lake Wildlife Management Area form two of the three most important waterfowl habitat areas. Waterfowl values and potentials of these areas are dependent upon maintaining or improving present water supplies. Malheur Lake has been retained in its natural state and, as such, serves as an outstanding example of marsh ecology.

Wildlife values of the Malheur refuge are dependent largely upon flood flows of the Silvies River. These flows vary widely on an annual basis and this is vital to sustaining desired marsh ecology in Malheur Lake. During drought years, dense stands of

undesirable vegetation are killed or retarded and control of carp is simplified. During high water years that follow, major food producing plants such as sago pondweed are extremely abundant and a more desirable vegetation-water ratio predominates. Frequent flooding is also essential to maintaining a desirable level of alkalinity in the marsh. This is accomplished when flood waters enter Malheur Lake, dilute the accumulated salts, and transport a portion of these salts into nearby lowland areas or Harney Lake. Storage and diversion of Silvies River flows for other purposes would be detrimental to the refuge and could drastically reduce opportunities to satisfy waterfowl hunting needs of the future.

Habitat Improvement

Lack of water is a principal limiting factor and various water retention devices and watershed management techniques offer significant opportunities for increasing the carrying capacity of present wildlife habitat.

Wildlife habitat can be improved by reducing domestic livestock grazing competition on key areas through better rotation and control of grazing, by improving livestock forage on lands not important as wildlife habitat, and by developing more watering areas to produce better distribution of grazing pressure.

Wildlife benefits from strategically-located waterhole developments. (Oregon State Game Commission)

Another major opportunity for improvement is revegetating key wildlife areas with forage species preferred by wildlife, including the use of irrigation where necessary. Publicly financed irrigation projects or private irrigation projects on Federal lands should provide not only compensation for wildlife habitat losses, but also enhancement of habitat for upland game, big game, waterfowl, and other wildlife on lands retained in public ownership. Enhancement could be attained by designating 5-10 percent of lands in such project areas to be held permanently in public ownership and improved specifically for wildlife purposes. Before the year 2020, it probably will be necessary to irrigate much of this reserved area in order to increase wildlife food and cover sufficiently to meet the needs.

Considerable work has been done by the Warner Valley Committee composed of the Oregon State Game Commission, Bureau of Sport Fisheries and Wildlife, and Bureau of Land Management to develop a multiple use plan for the north portion of the valley. The greatest wildlife benefit would be to waterfowl and other water-oriented birds, but mule deer, antelope, sage grouse, quail, and chukar would also benefit. The suggested developments would involve 25,000 acres of public land requiring about 37,500 acre-feet of water and provide a major increase in waterfowl hunting and other wildlife values. Stabilized water conditions and improved livestock grazing distribution provided by this program would result in improved wildlife habitat over a large area surrounding the development. Water would be obtained from Honey Creek and overflow from Hart Lake. A preliminary estimate of capital cost is $300,000. Detailed wildlife plans have not been completed, so annual benefits and costs are not available.

Silver Lake produces excellent waterfowl habitat during good water years and offers an opportunity to develop a highly productive waterfowl area. This could be accomplished by constructing a series of dikes and gravity flow diversions to establish a controlled marsh. No studies have been conducted to determine specific requirements, but wildlife associated benefits would be high.

Areas needing further study of habitat improvement potentials are found along the following streams and lakes:

Deep Creek
Chewaucan River
Abert Lake
Coleman Lake (South Warner Valley)

Preliminary estimates by the Oregon State Game Commission indicate that habitat improvement programs to provide for major increases in hunting include 140 miles of fence, 36,000 acres of habitat manipulation, acquisition of 32,000 acres of wildlife lands,

300 waterholes, and 10 miles of public access roads. These measures would involve public and private lands. Specific locations, costs, and benefits cannot be assigned without detailed study.

Projected wildlife habitat improvement means proposed by Federal and non-Federal agencies are included in table 91.

Greater Harvest

Mule deer can provide additional hunting at their present population level. However, improved hunter access and special hunting regulations will be needed to realize this potential. Pronghorn and mountain sheep hunts will continue to be extremely popular, but probably can be expected to provide only a modest increase in man-days of hunting.

Considerable increase in hunter-days can be supplied by the dryland-associated, upland game species. Improvements mentioned above will add to this available surplus.

The present waterfowl hunting pressure is light and could be increased considerably, but not enough to meet future hunting needs.

Augmentation of Supply

While artificial production of upland game will probably not be required in this subregion for some time, it does offer a means of stocking some of the habitat, particularly in the vicinity of new water developments. Introduction of new species represents another opportunity for providing additional upland game hunting.

Artificial production will probably not contribute to increased waterfowl hunting in the Oregon Closed Basin before the year 2020.

Table 91 - Wildlife Habitat Improvement Means, Subregion 12

Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Seeding and planting	acre	3,950	395.0	5,010	501.0	5,000	500.0
Forage release & prescribed burning	acre	1,550	8.6	1,400	10.4	1,400	10.4
Key area fencing	mile	10	10.0	20	20.0	20	20.0
Permanent openings	acre	20	2.0	30	3.0	30	3.0
Wildlife food crops	acre	22,250	83.4	28,000	112.0	40,000	150.0
Guzzlers	each	10	10.0	20	20.0	10	10.0
Shallow impoundments and marsh improvements	acre	26,010	983.0	7,020	242.5	7,010	235.5
Develop potholes	each	10	5.0	20	10.0	20	10.0
Develop nesting facilities	each	120	6.0	160	8.0	150	8.0
Sub-totals			1,503.0		926.9		946.9
Planning							
Big game range analysis	acre	431,500	43.0	Not available		Not available	
Upland game habitat surveys	acre	700,000	35.0	Not available		Not available	
Habitat management plans	each	4	2.0	Not available		Not available	
Sub-total			80.0				
Total			1,583.0				

Non-Federal							
		1980		2000		2020	
Measure	Unit	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)	Amount	Capital Cost ($1000)
Habitat improvement 1/	acre	20,000	324	7,000	153	11,000	287
Land acquisition 2/	acre	10,000	750	26,000	1,060	7,000	310
Fencing 3/	mile	100	70	20	14	20	115
Water developments 4/	each	225	64	300	140	250	58
Totals			1,208		1,367		770

1/ Includes cover plots, food patches, marsh development, nest structures, etc.
2/ Obtained by fee purchase and easement rights.
3/ Represents damage control structures erected by agreement with landholders to eliminate deer and elk depredations on private land, and to protect key wildlife habitat.
4/ Water developments consist primarily of guzzler installations and spring development (including fencing).

GLOSSARY

ALEVIN - A young fish; especially the newly hatched salmon when still attached to the yolk sac.

ANADROMOUS FISH - Species that are hatched in fresh water, mature in salt water, and return to fresh water to spawn.

ANGLER-DAY - A day or any part of a day spent fishing by an individual.

CARRYING CAPACITY - Ability of a given amount of habitat to support a certain population of animals at a given time.

CASE - As used in the commercial salmon packing industry, it denotes a standard weight container of 48 one-pound cans of these fish.

COLD-WATER FISH - Salmonid species that spend their entire life cycle in a fresh-water environment.

COMMERCIAL FISH - Species of fish which may be harvested and sold as a commercial venture.

DENSITY - The number of animals present on a given sized area.

DIGGER-DAY - A day or any part of a day spent gathering shellfish by an individual as recreation.

DUTCH MIRROR - A stationary automobile headlight reflecting device used to divert deer from crossing highway rights-of-way at night.

ECOSYSTEM - An interacting system of one to many living organisms and their nonliving environment.

EDGE - The border between vegetative types favorable to wildlife.

ENVIRONMENT - The total of all external factors that affect an animal.

ESCAPEMENT - Number of anadromous fish that return from the ocean to fresh-water streams and spawn.

EULACHON - Common name of a member of the smelt family (Osmeridae).

EXOTIC - Refers to an animal which has been introduced into a region, but which is not native to that region.

FERAL - Refers to a domestic animal which has reverted to the wild state. Examples are goats and pigs.

FINGERLING - Young fish which are self-subsistent but not mature.

GABION - An earth- or rock-filled structure which can be used to achieve better hydraulic characteristics in stream regimen and improve fish habitat and harvest.

GAME FISH - Those designated species of fish which may be taken by sporting means only.

GUZZLER - A watering device used in wildlife management.

HABITAT - Area which supplies food, water, shelter, and space necessary for a particular animal's existence.

HARVEST - Number of animals or fish taken from a population by man for sport or commercial purposes--usually refers to an annual period, and often expressed as a percentage of the total population.

HUNTER-DAY - A day or any part of a day spent hunting by an individual.

LENTIC - Of, relating to, or living in still waters such as lakes, ponds, or swamps.

LIMITING FACTOR - That which holds a population at a certain level at a specific time.

LITTORAL ZONE - The shallow area near the shore.

MAN-DAY - Synonymous with angler-day and/or hunter-day.

MARINE FISH - Fish that spend their entire life cycle in salt water.

PLANT SUCCESSION - The series of plant communities, each replacing another until the climax community stage finally is reached.

PREDATOR CALLING - A sporting activity in which various wildlife species, such as coyotes, are attracted to the caller by use of a whistle or similar calling device.

PREY ORGANISM - Living form that serves as sustenance for higher and usually larger forms in a food chain.

RECREATIONAL USER-DAY - A day or any part of a day spent in outdoor recreational activity by an individual.

REHABILITATION - Chemical treatment of a body of water to remove undesirable fish populations, followed by restocking with desired species.

RESIDENT FISH - Species that spend their entire life cycle in a fresh-water environment.

SALMONID - Refers to fish of the family Salmonidae. Includes salmons, trouts, whitefish, and char.

VARMINTING - A type of sport hunting involving nongame species of wildlife, such as crows, woodchucks, and coyotes. Usually associated with or involving predator calling.

WARMWATER FISH - Non-salmonid species of fresh-water game fish. Includes catfish and spiny-rayed fish such as bass, sunfish, and perch.

PARTICIPATING STATES AND AGENCIES

STATES

Idaho	Nevada	Utah	Wyoming
Montana	Oregon	Washington	

FEDERAL AGENCIES

Department of Agriculture
- Economic Research Service
- Forest Service
- Soil Conservation Service

Department of the Army
- Corps of Engineers

Department of Commerce
- Economic Development Adm.
- National Oceanic & Atmospheric Administration
  - National Weather Service
  - National Marine Fisheries Service

Department of Health, Education, & Welfare
- Public Health Service

Department of Housing & Urban Development

Department of Transportation

Department of the Interior
- Bonneville Power Adm.
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Mines
- Bureau of Outdoor Recreation
- Bureau of Reclamation
- Fish and Wildlife Service
- Geological Survey
- National Park Service

Department of Labor

Environmental Protection Agency

Federal Power Commission